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COMPUTER SIMULATION OF A FAMILY PRACTICE CLINIC

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THESIS

COMPUTER SIMULATION OF A FAMILY PRACTICE CLINIC

by

David Dilley
and
James Marion Larkins Jr.

Thesis Advisor: R.W. Butterworth

June 1973

T154912

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Computer Simulation of a Family Practice Clinic

by

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MASTER OF SCIENCE IN OPERATIONS RESEARCH

from the

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June 1973

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ABSTRACT

A simulation model of the Family Practice Clinic at Silas B. Hays Army Hospital, Fort Ord, California, is presented. The inputs to the model are the number of doctors, number and type of support personnel, number of waiting and examination rooms assigned and available to the clinic, and the population of potential patients assigned to each doctor, categorized by sex and age. The outputs of the model are the percentage utilization of doctors, support personnel, waiting and examination rooms, and the distribution of various waiting times for those being served by the clinic.

The purpose of the model is to permit hospital administrators to estimate the optimal number of families to assign each doctor in a Family Practice Clinic, and to estimate the support personnel and physical space required to effectively operate the clinic.

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I. INTRODUCTION

A. BACKGROUND

The American Medical Association (A. M. A.), the Department of Defense, and the Army, Navy, and Air Force are attempting to shift a large portion of medical practice from the impersonal realm of the specialists to that of a new generation of general practioners.

One of the most often heard complaints from patients about medical specialists, both civilian and military, is that the patient believes that the specialist is treating a disease or sympton and not the whole patient. Further, in the military community, the patient is often not able to see the same specialist for his follow-up treatment.

As the result of a felt demand, there has been an increase in the emphasis on the human relations aspect of family medical care. The U. S. Army has selected the Silas B. Hays Hospital at Fort Ord, California, as one of two Army hospitals to initiate an experimental program to provide family medical care to active duty and retired military personnel and their dependents. The new program is called the Family Practice Clinic, and is directed toward creating more of a "country doctor" atmosphere within the military community by assigning one doctor, a specialist in Family Practice, to provide medical care for a specific group of families.

The Family Practice Physician, or Family Physician, has been trained to provide primary care in such speciality areas

as pediatrics, obstetrics and gynecology, internal medicine, etc., and is able to provide total care for about 80% of the occurring medical problems. When necessary, the Family Physican will consult with other specialists to insure that his patients receive the best possible medical care.

Active duty and retired military personnel taking part in the Family Practice Program and all of their eligible family members will have one doctor whom they will see first for an illness, injury, pregnancy, and for routine matters such as well-baby exams, Pap tests, periodic check ups, etc. The same doctor will care for family members whether outpatients or admitted to the hospital.

Prior to the start of the Family Practice Clinic in January 1973, Hays Hospital was providing medical care for approximately 28,000 families, or about 85,000 individuals, plus 9,000 recruits assigned to Fort Ord for basic and advanced infantry training. The hospital staff in January 1973 was approximately 107 physicians, 145 nurses, and 1,240 other support personnel.

B. CLINIC DESCRIPTION AND OPERATION

The Family Practice Clinic began operation with four physicians, two nurses, two nurse clinicians, two medical aides, and four clerk-receptionists shared with the General Medical Clinic. The Family Practice Clinic, shown in figure 1, is located in Hays Hospital adjacent to the General Medical Clinic. The two nurse clinicians share the office indicated in the figure. The staff has access to the full range of laboratory

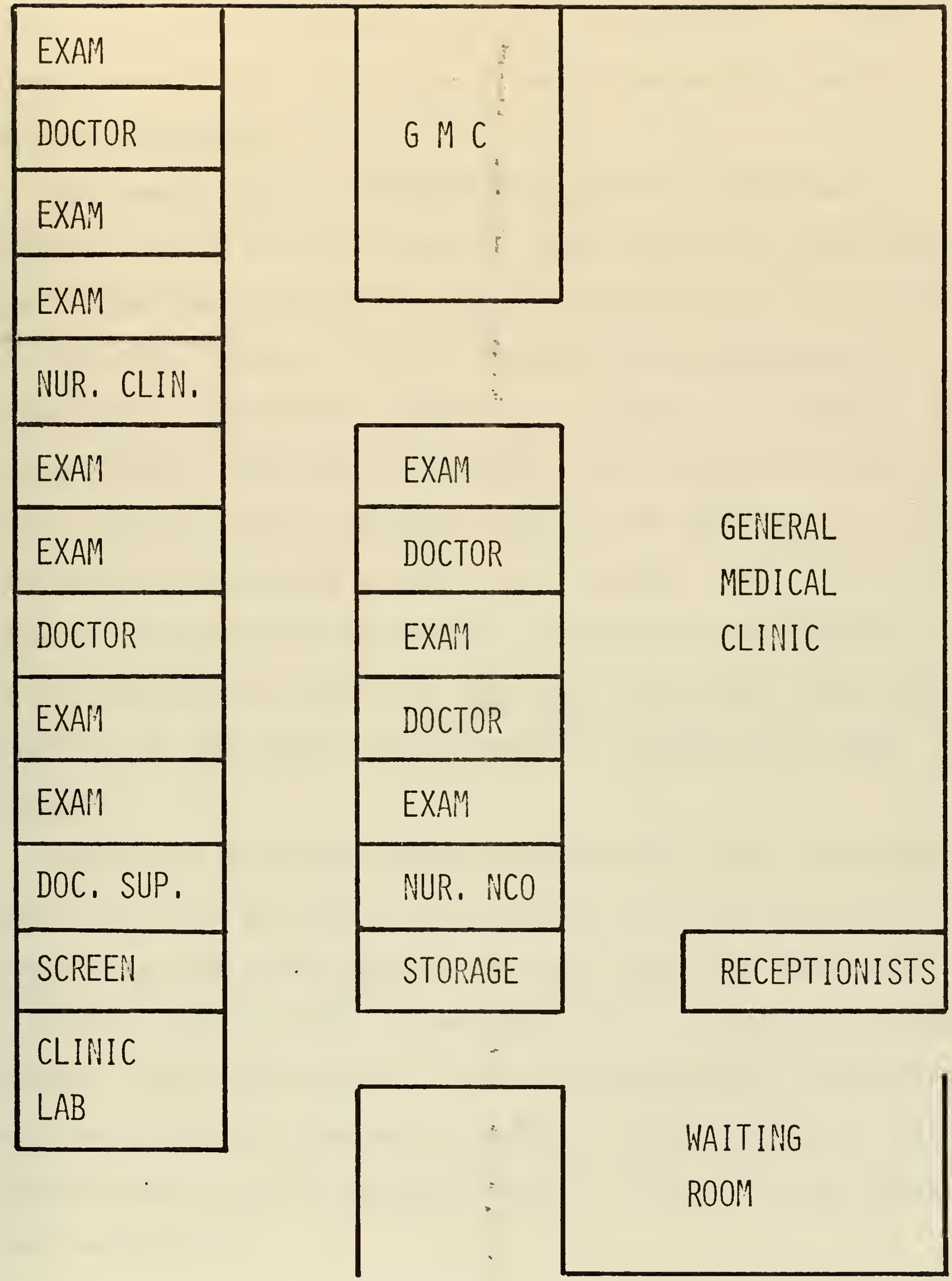


Figure 1. Hays Army Hospital Family Practice Clinic

facilities, X-ray machines, medical specialists in other disciplines, etc., available in any other modern, well equipped hospital.

The general flow through the clinic is indicated in Figures 2.a, b., c., d., and e. When the need to seek medical attention occurs, the patient either calls the office or walks in. When a call is received the receptionist schedules the patient or forwards the call to a nurse. The nurse screens the call to determine the severity of the problem, and then either forwards the call to the doctor or has the patient scheduled by the receptionist. The doctor takes calls forwarded and advises the patient to be scheduled, or, if the problem is acute, to come into the office that day. Periods are set aside in the doctor's schedule for this purpose.

Emergency Patients during office hours take precedence over all other patients and take a doctor away from the clinic for the time required on that case. An emergency is handled by the patient's assigned doctor, if he is in the office, otherwise another doctor will be called. Patients waiting to see the doctor attending to the emergency will be rescheduled, seen by another doctor, or wait to see their assigned doctor.

A doctor's first appointment period in the morning is set aside for walk-ins. This is designed for military personnel, and is similar to sick call. The next ten appointment periods are for scheduled patients, followed by four

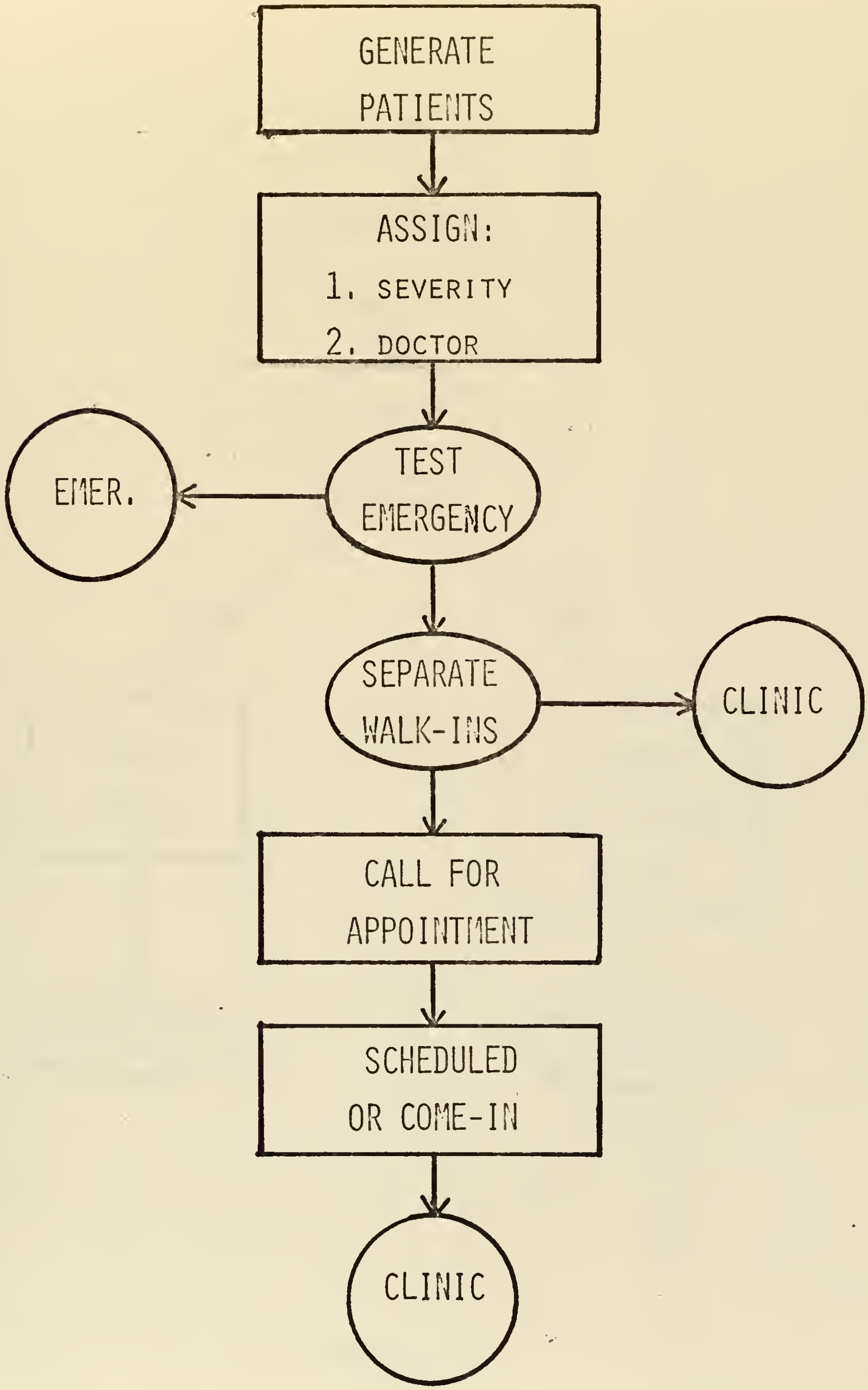


Figure 2.a. Clinic Flow Diagram

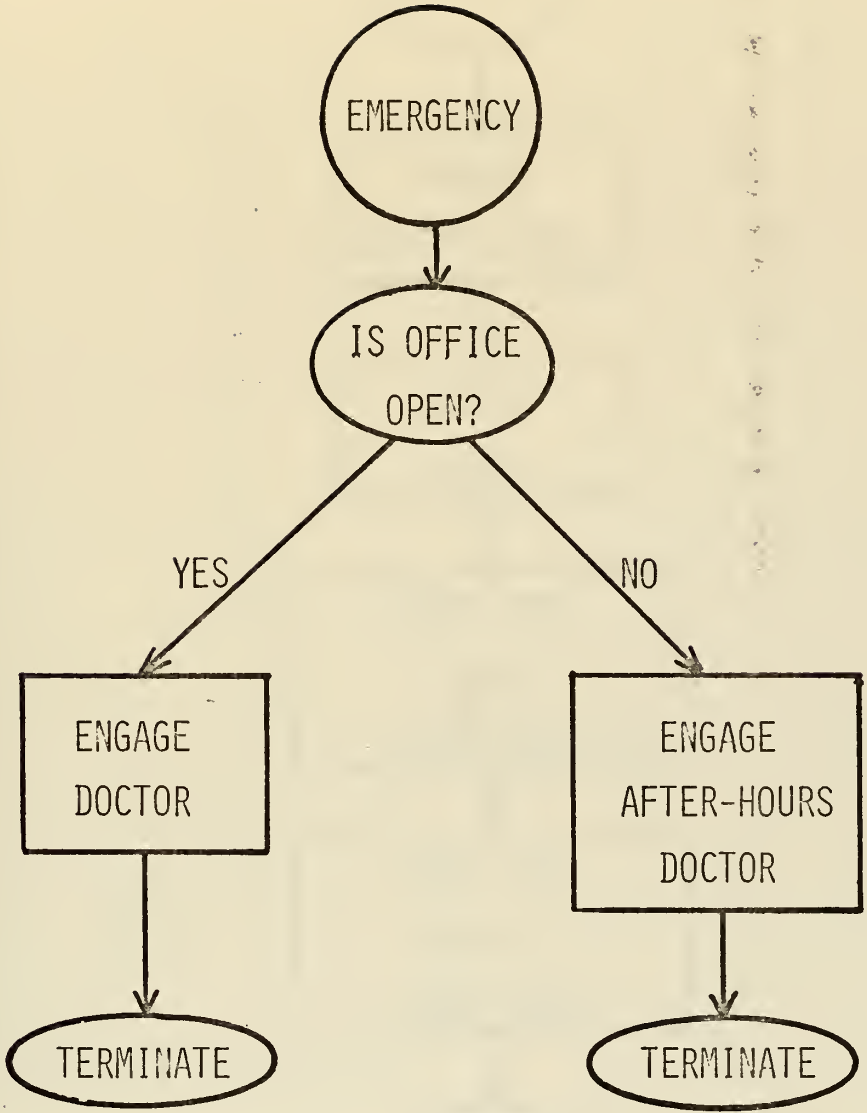

EMERGENCY
IS OFFICE OPEN?
YES
NO
ENGAGE DOCTOR
ENGAGE AFTER-HOURS DOCTOR
TERMINATE
TERMINATE

FIGURE 2.B.

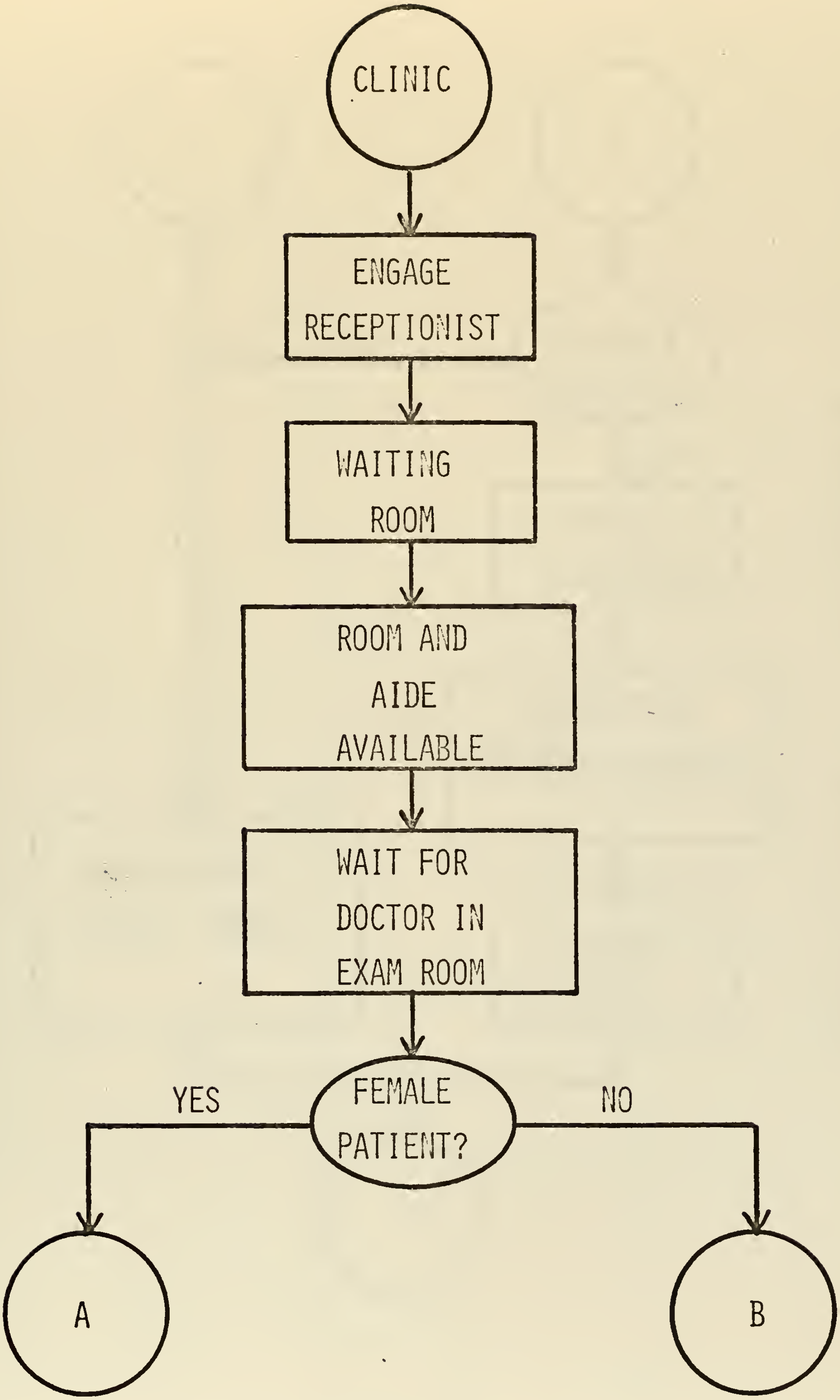

CLINIC
ENGAGE RECEPTIONIST
WAITING ROOM
ROOM AND AIDE AVAILABLE
WAIT FOR DOCTOR IN EXAM ROOM
FEMALE PATIENT?
YES
NO
A
B

FIGURE 2.c.

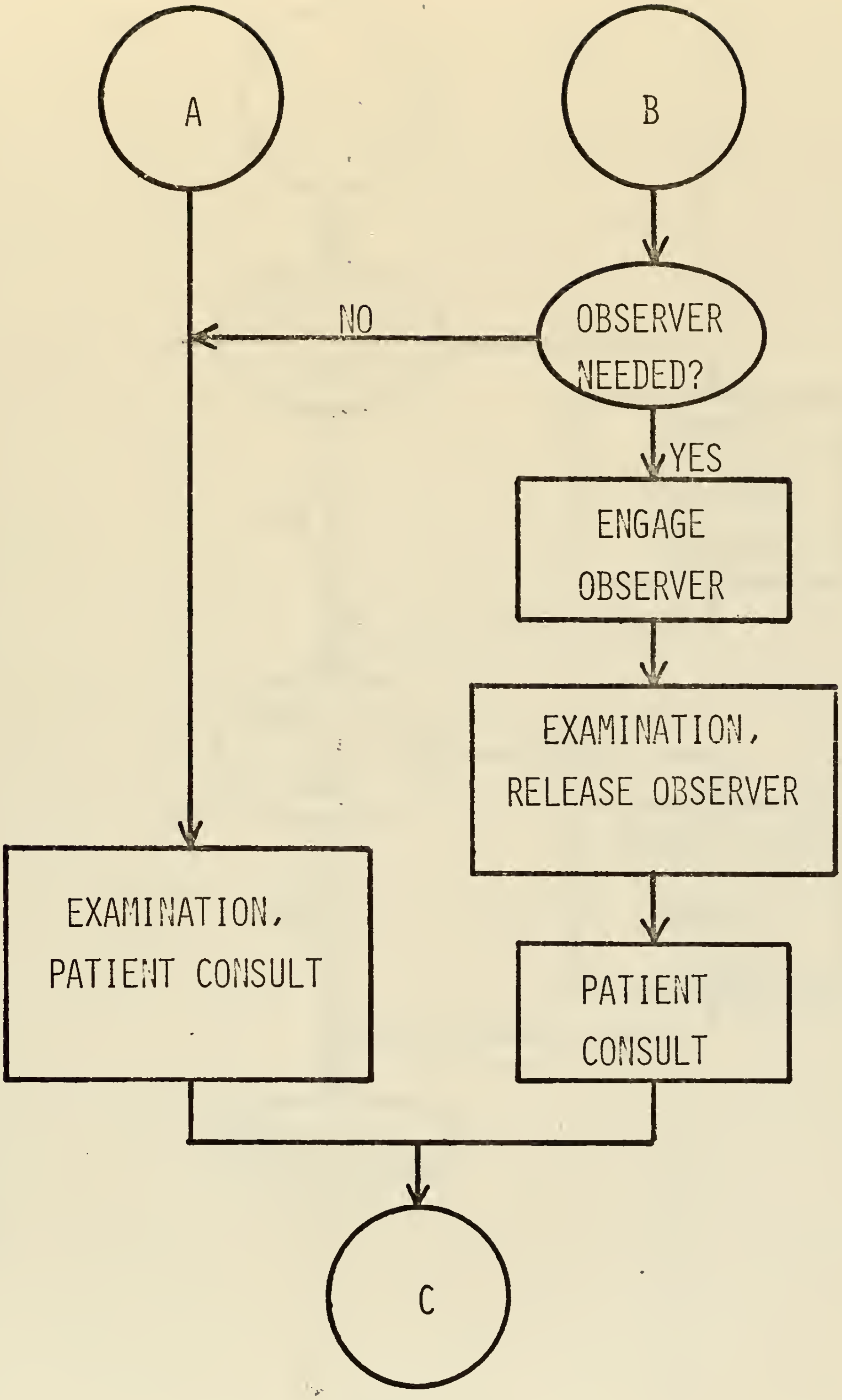

A
B
OBSERVER NEEDED?
NO
YES
ENGAGE OBSERVER
EXAMINATION, RELEASE OBSERVER
EXAMINATION, PATIENT CONSULT
PATIENT CONSULT
C

FIGURE 2.D.

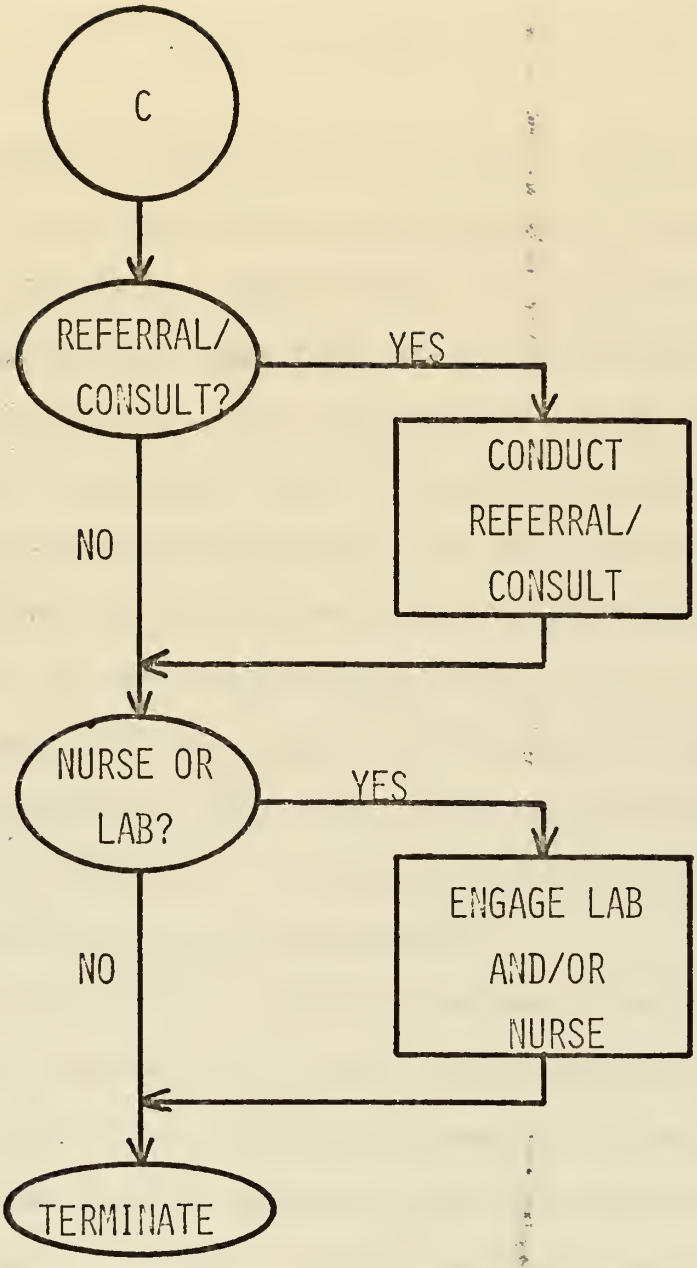

C
REFERRAL/
CONSULT?
YES
CONDUCT
REFERRAL/
CONSULT
NO
NURSE OR
LAB?
YES
ENGAGE LAB
AND/OR
NURSE
NO
TERMINATE

Figure 2.e.

for patients who called in and must be seen that day. The afternoon schedule is similar except that the sick call period is omitted.

When a non-emergency patient arrives at the clinic, the receptionist logs the arrival and has the patient's chart waiting if it was a scheduled appointment. If the chart has not been pulled, the patient must then go to the record division to check out the chart. Next the patient enters the waiting area to wait for an exam room to become available. As the patient enters the waiting room, one of three priorities has been assigned to the patient by the receptionist. The highest priority is for scheduled patients, next is for those who called ahead, and the last priority is for walk-ins. In order to go into an exam room, three things must occur; (1) exam room available, (2) aide available, and (3) patient must be the highest priority waiting.

When all three of the above criteria are met, the aide takes the patient to the screening room and performs any preliminary work needed, such as blood pressure, temperature, and history. Next the patient waits in the exam room until the doctor is available. When the doctor arrives, he conducts the examination and in some cases, if the patient is female, he must obtain an observer. The observer is sometimes a friend or relative of the patient, but at other times the doctor must utilize a nurse or an aide.

Periods with the doctor are normally scheduled for fifteen minutes, but in some cases (physicals, or other extensive

examinations/consultations) a longer time is required. These patients are scheduled for thirty minutes, an hour, or an hour and a half.

There are cases when a doctor needs to consult with a nurse clinician. These cases would usually be of a chronic nature and the doctor would like the nurse clinician to follow the case and attend to the patient on subsequent visits. An example of this situation would be that of a diabetic patient, after diagnosis, being scheduled for routine follow-up visits with the nurse clinician. In this situation the nurse clinician would handle the visits and notify the doctor if anything unusual occurred. Nurse clinicians care for patients referred to them by all four doctors. Patients waiting to see the nurse clinicians follow the same general routine as those waiting to see a doctor.

In each category of problems there is a possibility that the doctor will want to consult with a specialist in another medical area. In these cases the doctor either calls the specialist or prepares a "consult" form and sends the patient to the specialist. The Family Physician will continue to follow the patient's progress.

After the patient completes his visit with the doctor or nurse clinician he may leave, require lab work, or in some cases the patient is required to see a nurse for immunizations or other medication. When this is complete the patient will leave the clinic.

C. STATEMENT OF THE PROBLEM

One of the many decisions that had to be made by the hospital administrators concerned the question of the number of families to assign to each doctor. These families make up the population which serves as potential patients for the doctors in the clinic, and are referred to as the doctor's "patient panel." The hospital administrators expressed a strong desire to have each doctor serve and treat a patient panel that was representative of the entire population being served by the hospital. The recruit population is not considered a part of this basic population.

Hays Hospital has been accredited by the American Medical Association as a teaching hospital which allows doctors to serve their residencies there. One of the requirements laid down by the A. M. A. dealt with the breadth of medical problems seen by a resident in the Family Practice speciality. The resident must deal with the full range of medical problems that a Family Practice Doctor is competent to handle. The clinic doctors must, therefore, be assigned families with young children, older children, pregnant females, middle aged and elderly people, etc., in approximately the proportion that they occur in the total population being served by the hospital.

Once the proportions of age/sex categories have been determined, the question of the total size of the patient panels assigned to each doctor presented itself. One of the

goals of the Family Practice Clinic was to increase overall patient satisfaction for the largest number of families. If the doctor is assigned too small a patient panel, patient satisfaction will be high and doctor utilization will be low. When too large a patient panel is assigned, doctor utilization will be high, but patient waiting times will greatly increase, leading to a drop in patient satisfaction.

Another decision faced by the hospital administration concerned the size and composition of the clinic staff. The number of doctors in the clinic was fixed at four and was assumed to stay constant throughout the operation of the clinic. However, the number and type of nurse clinicians, nurses, aides, and clerk-receptionists to assign to the clinic was a major question.

The nurse clinician is a relatively new member of the health care team. Many hospital administrators, doctors, and even nurse clinicians themselves are uncertain as to how many of the duties traditionally reserved for a doctor that they can assume. Nurse clinicians are more highly trained than nurses, and in any case they can assume many of the doctor's routine functions of well baby care, routine pediatric care, follow up care for geriatric patients, diabetics, etc., and routine prenatal checkups, etc., depending on the nurse clinician's speciality area.

The first problem addressed in this thesis is that of estimating the total number of families to assign each doctor so as to maximize the utilization of his time and maximize

patient satisfaction, measured solely by waiting time in the clinic and time spent waiting for an appointment. An ancillary part of this problem is determining the percentages of each age/sex group assigned to each doctor to reflect the population served by Hays Hospital. Further, the number of clinic visits from those in each age/sex group must be estimated in order to correctly gauge the expected work load of each doctor.

The second problem considered was that of maximum utilization of clinic support personnel and the physical layout of the clinic itself in order to most efficiently serve the patient panels.

II. PROBLEM FORMULATION

A. THE PATIENT PANEL

The problem of estimating the makeup of the potential patient population served by Hays Hospital proved to be a major one.

A one percent sampling of the hospital outpatient medical records was taken. Among the items of information were; the sex and age of military sponsor and dependents, and the number of visits to the hospital in the period from 1 July 1971 to 30 June 1972.

The data gathered, however, were not the entire answer to the problem of determining the potential population of the hospital. Some of the potential categories were simply not represented in the sample. Since dependents are no longer required to keep their medical records at the hospital, many of them are kept at their homes. Similarly, most of the active duty sponsors' records were kept at their military unit dispensaries and were not readily available. One of the biggest factors which lowered the credibility of the data obtained from the one percent sample was the fact that some active duty personnel and a larger number of retired personnel and their dependents do not utilize the medical facilities at Hays Hospital for all of their health care needs. Furthermore, some personnel, retired as well as those on active duty, do not make use of the hospital at all.

Data was available concerning the age distribution of military personnel and their dependents from one training command brigade. The training brigade data and the one percent sample data has been combined in Figure 3, and indicates the authors' best estimate of the age distribution of the potential population served by Hays Hospital.

The densities in Figure 3 are certainly open to question, but a more detailed and lengthy examination of data not readily available, if available at all, is beyond the scope of this thesis.

B. PATIENT INCIDENCE DATA

One of the more critical areas of the Family Practice Clinic model is that portion of the model which determines the arrival rates of patients at the clinic. The patient arrival rate at the clinic is determined by three factors: the age distribution of the patient panel, the distribution by sex, and the size of the population in each age/sex category.

In order to successfully model the Family Practice Clinic the authors felt that it was essential to know two things about a group of people once their age and sex were known: how often would a person, on the average, visit the clinic if they (or their parents) were satisfied with the quality of medical care received, and with what frequency would certain medical skills or knowledge be used during those visits?

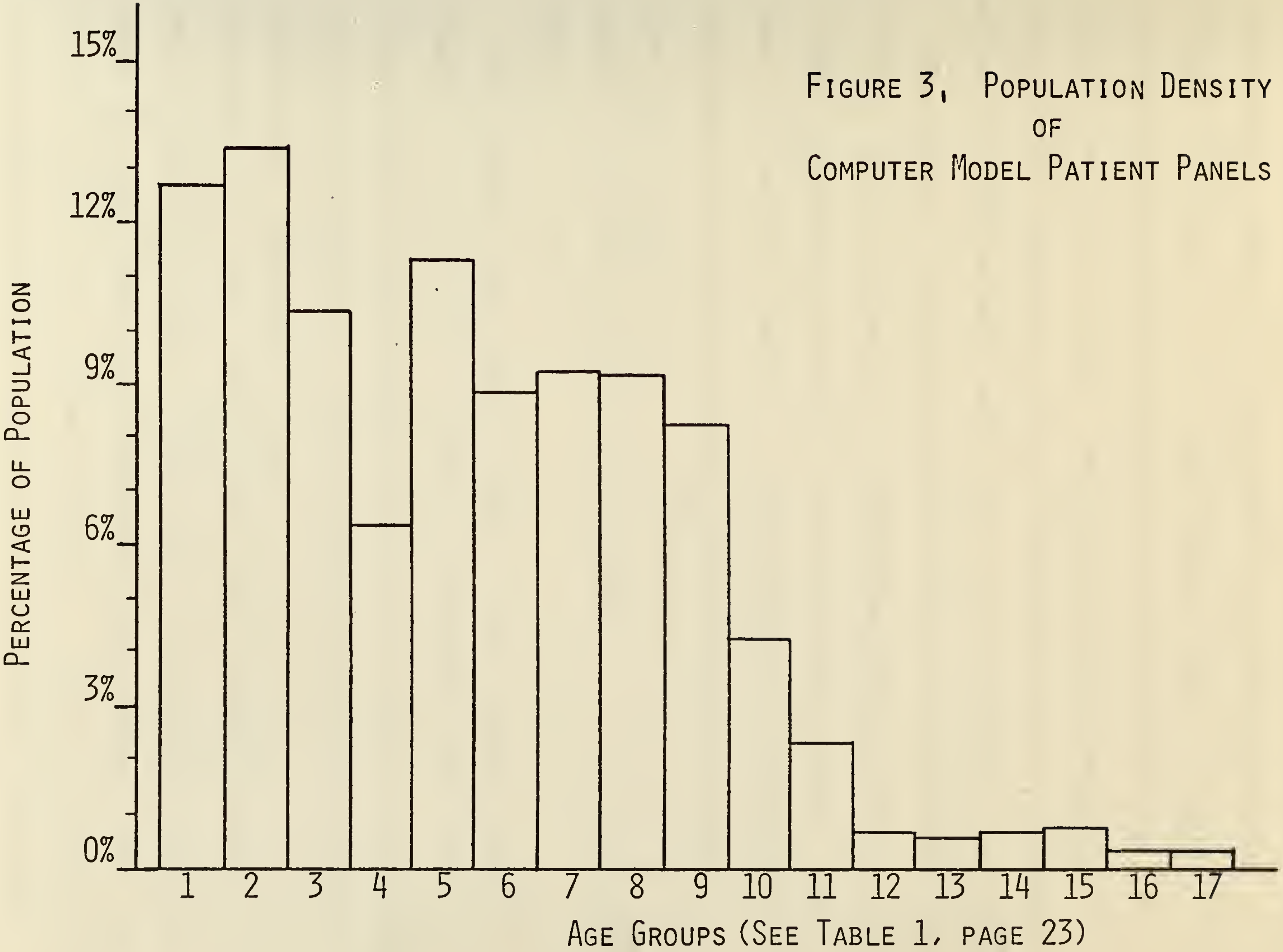


Figure 3, Population Density of Computer Model Patient Panels

Again, the data from the one percent sample of outpatient records was incomplete for estimation of the values noted above. Not all of the people using the hospital utilize it exclusively for their medical care. Finally, the medical records were unclear as to the reason for the visit noted in the record. Short of attending medical school, there appeared to be no practical method of making use of the limited data available from the medical records.

The authors considered the fact that the clinic records of total visits per month for the different clinics might be used to obtain the patient visit incidence rates. This idea was discarded because of the drawback of insufficient knowledge of the base population from which the clinics drew these visits, and the unquantifiable reluctance of people to use the clinic and go elsewhere for their medical care.

The authors were able to obtain a five percent random sample of patient visit incidence data drawn from a one million member prepaid health plan for the period January through December 1971. Each record contained the following information: the patient's date of birth, date of visit to the clinic, and the medical area of the clinic visited, or medical specialty codes. There were 73 different specialty codes utilized, these were combined by the authors into nine general medical areas shown in Table 1. Table 1 also includes the age codes used when analyzing and presenting the data.

COMBINED MEDICAL SPECIALTY AREA (SPECIALTY CODE NUMBER)	INDIVIDUAL PHYSICIAN AND NON M. D. SPECIALISTS
General Practice (1)	General Practice
Surgery (2)	General, Neurological, Plastic, Orthopedic, and Thoracic Surgery, and Anesthesiology
Alergy/Shots (3)	Alergy, Alergy Testing and Treatment, Injection and Immunization
Eye, Ear, Nose, Throat (4)	Otology, Laryngology, Rhinology, Opthalmology, Optometrist, and Audiologist
Internal Medicine (5)	Internal Medicine and Gastroenterology
Miscellaneous (6)	Cardiovascular Disease, Neurology, Pathology, Physical Medicine and Rehabilitation, Psychiatry, Pulmonary Diseases, Radiology, Urology, Dietician, and Psychologist
Dermatology (7)	Dermatology
Obstetrics/Gynecology (8)	Obstetrics/Gynecology
Pediatrics (9)	Pediatrics

AGE CODES

Age*	Age Code	Age*	Age Code	Age*	Age Code
0-4	1	30-34	7	60-64	13
5-9	2	35-39	8	65-69	14
10-14	3	40-44	9	70-74	15
15-19	4	45-49	10	75-79	16
20-24	5	50-54	11	80 +	17
25-29	6	55-59	12		

* Age at the time of the visit to the clinic

Table 1. Medical Specialty and Age Codes

It is felt that this incidence data more nearly reflects the true propensity of a population to utilize medical care facilities than that obtained from the one percent sample of medical records from Hays Hospital. People who have already paid for their health care are not likely to go elsewhere and pay for it again, and they are also not likely to be shy about using the medical facilities when they believe such care is needed.

The data for male and female visits is summarized in Tables 2 and 3 by age and specialty codes. The letter 'A' in the specialty code column refers to the "actual" average visits per person per year for each age group and medical specialty category, calculated from the five percent random sample data. The letter 'C' refers to a "combined" rate.

In order to simplify the computer model simulation problem, some of these visit rates were combined horizontally and an average or combined rate was used. Instead of considering each age group in a medical specialty area to have a separate visit rate, these rates were combined when they were close to the same values. For example, the actual average number of visits to the General Practice section of the clinic for a male in age groups 4, 5, and 6 was 0.73, 0.76, and 0.71 visits per person per year, respectively. These rates were combined, or averaged, to yield a value of 0.73 visits per year for a person in age groups 4, 5, or 6.

AGE CATEGORIES

SP CODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1C	0.76	0.53	0.53	0.73	0.73	0.73	0.57	0.57	0.57	0.57	0.57	0.64	0.64	0.64	0.64	0.64	1.35
1A	0.76	0.52	0.54	0.73	0.76	0.71	0.60	0.58	0.55	0.58	0.51	0.63	0.54	0.72	0.75	0.77	1.35
2C	0.34	0.34	0.34	0.50	0.50	0.50	0.50	0.50	0.58	0.58	0.58	0.58	0.82	0.82	0.82	0.50	0.50
2A	0.37	0.26	0.41	0.55	0.44	0.50	0.47	0.53	0.56	0.56	0.58	0.65	0.81	0.81	0.83	0.51	0.47
3C	1.19	1.57	1.57	1.05	0.68	0.68	1.08	1.08	1.08	1.08	1.08	1.08	0.61	0.61	1.18	0.51	0.51
3A	1.19	1.58	1.55	1.05	0.63	0.72	1.19	1.09	0.98	1.05	1.15	0.94	0.60	0.62	1.18	0.46	0.61
4C	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.62	0.62	0.62	0.62	1.20	1.20	1.20	1.20
4A	0.22	0.41	0.30	0.29	0.27	0.31	0.34	0.32	0.35	0.50	0.64	0.63	0.80	1.16	1.24	1.19	1.37
5C	0.08	0.08	0.08	0.77	1.15	1.15	1.15	1.15	1.15	1.46	1.87	1.87	2.48	2.48	2.48	2.90	2.90
5A	0.06	0.04	0.13	0.77	1.16	1.11	1.14	1.17	1.20	1.46	1.78	1.97	2.45	2.51	2.48	2.96	2.77
6C	0.14	0.14	0.14	0.14	0.14	0.14	0.46	0.46	0.46	0.46	0.64	0.64	1.14	1.14	1.14	1.14	1.14
6A	0.07	0.11	0.08	0.17	0.18	0.26	0.39	0.43	0.52	0.49	0.65	0.62	1.00	1.22	1.43	1.23	0.83
7C	0.07	0.07	0.07	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.56
7A	0.04	0.06	0.12	0.27	0.24	0.19	0.20	0.18	0.15	0.22	0.21	0.22	0.26	0.30	0.34	0.24	0.56
9C	5.33	2.00	1.27	0.13													
9A	5.33	2.00	1.27	0.13													
TOTC	8.22	5.04	4.31	3.85	3.73	3.73	4.29	4.29	4.37	4.99	5.58	5.65	5.53	7.11	7.68	7.08	8.16
TOTA	8.02	4.98	4.40	3.95	3.68	3.80	4.33	4.30	4.32	4.87	5.53	5.66	6.47	7.35	8.26	7.36	8.13

TABLE 2. MALE VISITS PER PERSON PER YEAR

AGE CATEGORIES

SP CODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1C	0.63	0.38	0.38	0.75	0.75	0.75	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.70	0.70
1A	0.63	0.38	0.38	0.71	0.82	0.74	0.65	0.64	0.62	0.59	0.60	0.56	0.56	0.65	0.61	0.71	0.69
2C	0.24	0.24	0.24	0.38	0.38	0.38	0.38	0.60	0.60	0.60	0.77	0.77	0.77	0.77	0.77	0.77	0.51
2A	0.31	0.18	0.25	0.35	0.33	0.42	0.43	0.53	0.62	0.66	0.70	0.69	0.82	0.98	0.86	0.84	0.51
3C	1.05	1.05	1.05	0.80	0.80	0.80	1.71	1.15	1.15	1.15	1.45	1.03	1.03	1.03	1.03	1.03	0.27
3A	0.97	1.25	0.97	0.83	0.58	0.97	1.71	1.15	1.26	1.06	1.45	0.93	1.27	1.03	0.77	1.04	0.27
4C	0.15	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.56	0.56	0.56	0.74	0.74	1.27	1.27	1.27	1.27
4A	0.15	0.36	0.37	0.40	0.37	0.35	0.34	0.38	0.49	0.59	0.60	0.67	0.83	1.16	1.39	1.30	1.37
5C	0.08	0.08	0.08	1.04	1.49	1.49	1.49	1.49	1.49	2.06	2.06	2.06	2.52	2.97	2.97	3.41	2.83
5A	0.05	0.04	0.14	1.04	1.37	1.48	1.45	1.58	1.62	1.90	2.07	2.25	2.52	2.90	3.08	3.41	2.83
6C	0.10	0.10	0.10	0.10	0.10	0.33	0.33	0.33	0.68	0.68	0.68	0.95	0.95	1.55	1.55	1.55	0.73
6A	0.06	0.09	0.06	0.15	0.18	0.29	0.34	0.41	0.63	0.65	0.78	0.98	0.91	1.48	1.67	1.57	0.73
7C	0.10	0.10	0.10	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.42	0.42
7A	0.05	0.06	0.17	0.38	0.28	0.26	0.18	0.24	0.19	0.22	0.21	0.24	0.26	0.21	0.27	0.46	0.33
8C	0.02	0.02	0.02	0.77	2.49	2.49	1.71	0.96	0.96	0.75	0.75	0.53	0.53	0.39	0.39	0.39	0.07
8A	0.01	0.01	0.04	0.77	2.56	2.43	1.71	1.09	0.84	0.79	0.71	0.59	0.45	0.42	0.40	0.30	0.07
9C	4.89	1.98	1.22	0.13													
9A	4.89	1.98	1.22	0.13													
TOTC	7.26	4.32	3.56	4.59	6.63	6.86	6.85	5.76	6.30	6.66	7.13	6.94	7.40	8.84	8.84	9.54	6.80
TOTA	7.13	4.34	3.58	4.75	6.51	6.94	6.81	6.03	6.28	6.47	7.11	6.91	7.63	8.84	9.03	9.62	7.05

Table 3. Female visits per person per year

The total visit rates are summarized across the bottom of the tables, both for the actual and combined rates.

The effect of applying the combined rates to the same population from which the original data was taken is indicated in Tables 4 and 5. It is noted that the overall effect on the number of visits generated when using the combined rates, compared to the actual number of visits, is very small.

Another factor which was investigated was the variation of the visit rates over time. Each age-sex-specialty category visit rate was calculated on a yearly and quarterly basis and the differences noted. The only significant seasonal variations observed were in the two lower age groups of the male and female pediatrics specialty area. These rates are noted in Table 6, and were used in several runs of the computer model noted later in the thesis.

In summary, the authors believe that the analysis of the five percent random sample data resulted in a good estimate of how often a person would be expected to visit a medical clinic, and what medical specialty areas that person would use in the clinic.

C. COMPUTER MODEL

The computer language General Purpose System Simulation (GPSS) was used to model the Family Practice Clinic (Program 1) and is well suited for clinic simulation because of the queuing aspects and alternative flow paths for patients. Simulation allows the prediction of effects that the differing

AGE CODE	COMBINED RATE INCIDENCE TOTALS	ACTUAL INCIDENCE TOTALS
1	17,648	17,223
2	13,633	13,474
3	12,274	12,536
4	9,471	9,722
5	6,188	6,103
6	7,408	7,555
7	7,889	7,962
8	6,757	6,780
9	6,796	6,686
10	7,764	7,580
11	7,617	7,543
12	6,435	6,445
13	5,518	5,467
14	3,605	3,728
15	2,381	2,561
16	1,161	1,207
17	685	679
TOTAL POPULATION	123,203	123,251

TABLE 4. SUMMARY OF ACTUAL AND COMBINED INCIDENCE RATES APPLIED TO MALE POPULATION

AGE CODE	COMBINED RATE INCIDENCE TOTALS	ACTUAL INCIDENCE TOTALS
1	14,901	14,635
2	11,199	11,257
3	9,799	9,853
4	10,958	11,344
5	14,373	14,114
6	15,997	16,186
7	12,406	12,342
8	8,875	9,284
9	9,826	9,798
10	10,956	10,640
11	9,964	9,940
12	7,817	7,785
13	5,950	6,139
14	4,424	4,424
15	2,976	3,035
16	1,611	1,624
17	476	494
TOTAL POPULATION	152,508	152,894

Table 5. Summary of Actual and Combined Incidence Rates Applied to Female Population

	MALE		FEMALE	
	AGE CODES		AGE CODES	
	1	2	1	2
YEARLY RATE	5.33	2.00	4.89	1.98
1ST QUATER RATE*	6.00	2.28	5.33	2.20
2ND QUATER RATE*	5.06	1.89	4.78	1.87
3RD QUATER RATE*	4.49	1.84	4.20	1.80
4TH QUATER RATE*	5.76	2.01	5.23	2.04

*ADJUSTED TO A YEARLY RATE

TABLE 6. PEDIATRIC VISIT RATES FOR CHILDREN, LISTED BY QUARTERS

personnel and patient panels would have on the flow through the clinic. After the initial set-up effects of changes can be examined on the model before their introduction into the clinic.

The personnel assignment in the model is similar to the assignment of personnel at the Hays Hospital Family Practice Clinic. One laboratory technician was added to determine the feasibility of including a small laboratory. For convience another doctor was added. This doctor assumes all emergencies which occur after the office is closed. Although the four doctors rotate the night call duty, the night call doctor being separate allows the development of statistics on the time spent by the doctors on night calls.

For the model, each nurse clinician has one exam room and each doctor is assigned two exam rooms. The schedule of doctors' office hours cycles every two weeks and is represented in Table 7. Nurse clinicians work each day and rotate Saturday duty. Nurses work the normal office days as do two of the aides. The other aide and one receptionist work nights and Saturdays. At Hays Hospital four receptionists work five days a week during regular office hours, but are shared with the General Medical Clinic, therefore only three receptionists were assumed for this simulation.

The above numbers of personnel and rooms were used as a starting point to measure the effectiveness of clinic operations. The number of personnel can be varied in order to obtain an optimal mix for a given patient panel. The number of exam rooms also may be changed to determine the effects of increasing or decreasing space. The number of doctors could be varied, but for purposes of this thesis they are kept constant..

1. Inputs

The data gathered and explained earlier determine the patient input into the model. The FORTRAN program (Program 2) utilizes this data and an input of the distribution of the ages for patients assigned to each doctor. The interarrival time of patients in each category is outputed in the form of a punched deck ready for insertion into the basic model. The other output is the distribution of assignments by medical specialty to doctors and nurse clinicians,

FIRST WEEK

Doctor	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Sun.
1	N	M	D	D	N	-	-
2	D	N	M	D	D	S	-
3	D	D	N	M	D	S	-
4	D	D	D	N	M	-	-

SECOND WEEK

1	D	D	N	M	D	S	-
2	D	D	D	N	M	-	-
3	N	M	D	D	N	-	-
4	D	N	M	D	D	S	-

D	Day Duty (0800-1700)	
M	Morning Duty (0800-1300)	
S	Saturday Duty (0800-1230)	Saturday duty doctors alternate weekend duty
N	Night Duty (1300-2030)	All night duties are followed by that doctor being on call

Table 7. Doctors' Schedule

based on the proportion of the load the nurse clinician can accept in each medical specialty category and the percentage of patients in a category assigned to each doctor. This produces a distribution of assignments to doctor and nurse clinicians in each of the various age/sex/medical specialty categories, and appears in the form of a punched deck which can be inserted into the basic model.

Three priorities were selected to describe the seriousness of a problem. These are:

(a) Emergency - problems that must be attended to in a short period of time. Problems such as severe accidents and cuts, cardiacs, and deliveries are included.

(b) Today problems - which must be attended to in the next period the office is open. Examples are high fever, abnormal bleeding and severe pain.

(c) Later problems - which can be delayed until the next available appointment time. Regular OB/GYN, aches and pains, well baby checks and physicals are included in this category.

The attempt was made to include as many of the normal operations of a clinic as possible. The data for the basic model was gathered from doctors' estimates and refs. 3, 4, 5, 7, 9, 10, 11, and 14.

2. The Model

Patients with problems are generated in one of ninety-two categories. These categories designate the age group, sex,

and which of the nine disease areas is involved. The interarrival times are based on the number of people assigned to the doctor in each sex and age group. The number of the disease is also assigned to each patient. Using this disease number, the severity of the problem and length of the appointment are assigned. The distribution of severities and appointment lengths were obtained from estimates made by the Family Practice Doctors at Hays Army Hospital. These distributions are estimated because the clinic had no data base and measurements were not possible.

If the problem is an emergency, it is separated from the other cases. If the clinic is open, the emergency is handled by one of the clinic doctors. After hours the emergency is treated by the doctor on call. In the model this doctor is the extra doctor, who for convenience handles all after hours problems. The service time for this doctor is considered exponental, because of the wide variation in problems considered as emergencies. The mean length of emergency service time, estimated by clinic doctors, was ninety minutes. This includes the total time required to handle the case, time to and from the emergency room and actual treatment time. The patient would usually be scheduled for an office appointment, but the input data to the model was based on single visits to the office and not on return visits.

When the emergency occurs during the day, the patient's doctor is called from the office to treat the problem. If the

patient's doctor is not in, another doctor in the office is selected. The service time for these emergencies is shorter than at night. The patients in the waiting room must wait until the doctor's return, and will increase the length of the doctor's day and the average time spent by a patient in the clinic.

If the problem is not an emergency, there is a possibility that instead of calling first, the patient will simply walk-in. The walk-in rate in General Medicine at Hays Hospital is fifty percent. It was hoped by the supervisors of the Family Practice Clinic that with personal doctor-patient contact this rate would be reduced to fifteen percent. The fifteen percent rate was used, but other rates were tested and their effect on clinic operation will be discussed later.

The patients in the "walk-in" stream are allowed into the clinic immediately if it is open. If the clinic is closed the patients are queued up, waiting for the clinic to open. To make the model perform close to actual clinic operations, problems generated between eight P. M. and four A. M. are delayed twelve hours. This causes approximately one-sixth of the total to arrive at office opening. Two-thirds are spread uniformaly over normal working hours (8-4). Walk-ins are still allowed during evening hours and this accounts for the other one-sixth. Upon arriving at the office walk-ins are given the lowest priority for seeing the doctor.

The receptionists are always engaged in the same order. The first is engaged if possible. If she is unavailable, then the second is engaged. Therefore the third is only engaged if all others are busy. From this set up, it is possible to estimate how many receptionists are used. During the daylight hours up to three receptionists can be used. In the evening only one receptionist is on duty. After the patient talks on the telephone with the receptionist he is scheduled or in some cases the call must be forwarded to a nurse for further screening. This nurse may handle the question or forward the call to the patient's doctor. Following this sequence the patient is scheduled. In the scheduling section, the patients who must be seen today are separated from "later problems." If there is room on the schedule, "today's problems" are scheduled. If the schedule for the patient's doctor is full for that day, the patient is placed in the queue for scheduled periods set aside for "today's problems." Four periods are reserved at the end of the morning for these problems. At the end of the afternoon period, the clinic is opened to all patients who must be seen today. These patients are allowed in at a rate of two patients every thirty minutes.

The regular schedule has ten openings, morning and afternoon. These are also at a rate of two every thirty minutes, starting at 0830. The period at 0800 is reserved for walk-ins. If a patient is to be scheduled for more than one period, the following patient is delayed for that number of periods.

After leaving the schedule section, all patients with either today or later problems are allowed to arrive according to an approximate normal distribution centered around their scheduled time. Even though patients are scheduled, this does not ensure that they will arrive, therefore a "no show" rate is included. If the patient does not show up he must be rescheduled. A rate of five percent was estimated by personnel at Hays Hospital.

When the patient enters the clinic, they engage a receptionist. During the day there are three receptionists available but at night only one is on duty. The receptionist's time with a patient was assumed to be uniformly distributed over (1,5). See Table 8. This means that each minute between one and five is equally likely. If the patient is a walk-in and his doctor is not in the office, another doctor is assigned to handle the problem. Following this the patient enters the waiting room where he remains until an exam room is vacated, he is the highest priority patient waiting to see his doctor, and there is an aide available to take him back and make all preparations to see the doctor. At this point the patient waits for the doctor to arrive in the exam room.

Upon the doctor's arrival, the model determines if the patient is female and if so, requires an observer for forty percent of all female patients under fifteen years of age and seventy percent of all female patients fifteen and older. The break at fifteen is caused by the fact that

CATEGORY	MINIMUM	AVERAGE	MAXIMUM	DISTRIBUTION
NIGHT EMERGENCY	0	90	720	EXPONENTIAL
DAY EMERGENCY	0	40	320	EXPONENTIAL
RECEPTIONST PHONE CALLS	2	3	4	UNIFORM
DOCTOR/NURSE PHONE CALLS	1	3	5	UNIFORM
ARRIVAL TIME RELATIVE TO SCHEDULED TIME	-30	0	+30	APPROXIMATE NORMAL
RECEPTIONIST TIME	1	3	5	UNIFORM
AIDE TIME	1	5	9	UNIFORM
OBSERVER (FEMALE)	6	8	10	UNIFORM
DOCTOR/PATIENT CONSULT (FEMALE)	3	5	7	UNIFORM
EXAM/CONSULT (NO OBSERVER)	8	13	18	UNIFORM
EXTRA PERIODS	15	15	15	CONSTANT
NURSE CLINICIAN CONSULT	1	5	9	UNIFORM
DOCTOR CONSULT	5	10	15	UNIFORM
DOCTOR'S TIME SPENT ON REFERRAL	3	5	7	UNIFORM
NURSE'S TIME WITH PATIENTS	3	10	17	UNIFORM
TIME IN THE LAB	5	10	15	UNIFORM

ALL TIMES LISTED IN MINUTES.

TABLE 8. SERVICE AND ARRIVAL TIMES

younger patients are usually accompanied by another person. The observer engaged is either a nurse or an aide. The time for these female examinations was considered to be between six and ten minutes. All of these figures are based on estimates by doctors assigned to the Family Practice Clinic.

If the patient needs an observer, time is added following the examination for a doctor-patient conference. This conference time is usually short and is considered to be between three and seven minutes. For all male patients and those female patients not requiring an observer, the examination and consult time was estimated to be equally likely between eight and eighteen minutes. The mean of both routes, observer and no observer, is thirteen minutes. If the patient requires more than one period, fifteen minutes are added for each additional period.

To this point, patients assigned to both doctors and nurse clinicians follow the same sequence of events. But the flow changes here to allow for differing events. If the patient is not assigned to a nurse clinician, the doctor may have to consult with the nurse clinician to set up an ongoing attack on the problem. This rate was set at five percent. The model allows the consultation to be with the first nurse clinician available, if both are present. If only one nurse clinician is working, the other is bypassed. If neither is in the office no consultations are possible, and the nurse clinician is bypassed.

There are times when the nurse clinician must consult with the doctor. A rate of ten percent is used for these consultations, which include anything unusual noted during the clinician's examination. The time for the consultations was considered to be between five and fifteen minutes.

Another event that sometimes occurs in a clinic is the need to consult a specialist. Even though a patient may be referred to a specialist, the doctor continues to monitor the progress of treatment. The referral rate was estimated by the personnel at the Hays Hospital Family Practice Clinic. Rates were assigned to each of the nine problem categories. Twenty-five percent was the highest rate used. This occurred in the surgery area. The lowest, five percent, occurred in the allergy and immunization category.

The next section handles those patients who require the attention of a nurse. Because the nurses only work during the day, provisions are made to skip over this section at night and on Saturdays. If the nurses are there, it was estimated that ten percent of the patients would need to see the nurse for immunizations or other needed treatments. After this, it is sometimes necessary for the patient to return to the doctor. The basic rate used for return was three percent.

The last section is the laboratory in the clinic. This had little effect on the rest of the model. There are some patients who after going to the lab are to return to see the doctor. The rate of return from the lab was set at

ten percent. Five and twenty percent were tried but had little or no effect on the output.

3. Timer

The timer section runs for a total of twenty-eight days. It opens and closes the clinic, switchboard and portions of the schedule. It also controls the arrival and departure of personnel. This part of the model is divided into two major areas, weekdays and weekends.

4. Measures of Effectiveness

Several measures were used to determine the effectiveness of the clinic model. The measure used for doctors and all clinic personnel will be referred to as "utilization," which is given by $UTIL_{ts}=TB/TS$, where TB is the time busy and TS is time scheduled. A second form of utilization will be used for doctors and patients and will be called "time there utilization." The time there utilization is given by $UTIL_{tt}=TB/TT$, where TT is the time there. The measure referred to as "patient's time" is the average time a patient spends in the clinic from arrival until departure from the doctor's exam room. The last measure, other than standard averages, is the "doctor's time." This is the total number of minutes spent in the clinic, available to see patients, during the time period covered by the run (usually three months). This time varies with the quitting time of each day and in all cases is greater than the doctor's scheduled time. "Doctor's time" is used as the divisor to determine "time there utilization."

Many statistics are available from each computer run. Not all are presented in this paper, but could be used for a more detailed analysis of any section of the model. Although all of the possible output is not recorded in this paper, it was examined. Given more time and resources a more detailed analysis could be performed in each small area of concern. The questions put forth in this paper are not affected by minute details, but are a measure of overall trends and utilizations.

5. Parameter Sensitivity

The model was always run initially one month during which no statistics were gathered. This allowed the system to be pre-loaded with patients and smooth the starting up shocks. For the next three months, snapshots were taken at the end of each month. In this way not only could an average over the three month period be obtained, but trends in the output could be identified.

Realizing that many assumptions were made, several computer runs were made to determine the sensitivity of the various parameters. To develop a base on which to test the sensitivity to change of these parameters, three simulations were performed varying only the random number seeds. These three sets of output were then used to determine if significant changes had occurred. The comparison of means and t-test were used to determine if the changing of random number seeds had any effect on the model. These results are listed in Appendix A. All means remained relatively close and the

t-test, at ninety-five percent confidence, showed no significant differences. Therefore, it is noted that the model does not seem to be sensitive to changes in the random number seeds.

Two methods of comparisons were used. The first was direct comparison of means. This was used to compare utilization of nurse clinicians and ancillary personnel as well as waiting times. The second method was the use of a t-test. This was used to test the significance of change in doctor's utilization, patient's clinic time, and the total doctor time spent in the clinic. Assuming that each doctor is independent of the others, each run produced data points in each category. Combining all three basic runs, this produced twelve basic data points. Each test, therefore, tested the difference of mean in two samples. One consisted of twelve points, the other consisted of four points. This gave a t-test with fourteen degrees of freedom. A ninety-five percent confidence interval was chosen. All t-scores are listed along with other data from each run in Appendix B.

The basic data is derived from averages of the three initial runs (Appendix A). Appendix B lists the results from each of the sensitivity runs. The basic data (B-1) is used to make the following analysis.

a. Appointment Time

The appointment size or visit length (fifteen, thirty, sixty, or ninety minutes) was drawn from one of nine distributions depending on disease category. Two runs were

made to determine the model sensitivity to this variable. The first run set all distributions equal to the low of eighty percent. This means that twenty percent of all patients are seen for thirty, sixty, or ninety minutes. This run showed a three percent decrease from the basic run in patient utilization (Table 9.a.) Patient's and doctor's time in the clinic increased, but not significantly according to the t-test at ninety-five percent confidence level. Doctor's utilization and time there utilization both increased significantly.

The second change was to increase all distributions to ninety-seven percent minimum time visits. This effectively made almost all visits fifteen minutes in length. In this run, patient's utilization increased eleven percent up to forty-four percent. All other parameters tested decreased. Waiting room time decreased seventeen minutes. All four parameters tested by the t-test were found to have significantly decreased.

This distribution can not be affected greatly by changing the operation of the clinic, but does have a great effect on the clinic. If the visit lengths were shorter, more patients could be assigned to each doctor.

b. Emergency Rate

The percentage of emergency cases was dependent upon the disease category. This percentage ranged from one-half of one percent in the dermatology area to five percent

PARAMETER	DOCTORS' UTILIZATION		PATIENT TIME		PATIENT UTILIZATION (%)	WAITING ROOM TIME (MIN)	APPENDIX RUN #
	MEAN (%)	T-SCORE	MEAN (MIN)	T-SCORE			
Basic	94.8	0	76.7	0	33	41	B-1
Appointments							
Larger	98.3	2.60*	83.2	1.16	30	40	B-4
Smallest	79.8	8.61*	55.8	3.84*	44	24	B-5
Emergency							
Low Rate	97.1	1.60	77.9	0.21	32	39	B-6
High Rate	97.4	1.91*	78.4	0.31	32	38	B-7
Uniform Emergency Time	95.2	0.23	72.1	0.78	35	34	B-8
Pediatric Rate							
Highest	93.7	0.80	73.7	0.51	34	35	B-9
Lowest	94.2	0.46	75.1	0.26	33	37	B-10
Walk-in Rate							
25%	95.1	0.18	92.2	2.51*	27	51	B-12
50%	91.8	1.90*	112.8	3.12	22	71	B-13

* Significant by T-test (i.e. exceeded 1.76)

Table 9.A. Parameter Comparisons

in the OB/GYN area. The average was approximately three percent. Two simulations were performed varying these rates.

The first run set all emergency rates to one percent. This change had little effect on any of the measures (Table 9.a.), except the night doctor's utilization, which was cut in half. There was a very slight increase in the utilization of the ancillary personnel. But this is explained by the fact if emergencies are decreased and total occurrences remain constant, the number of less severe cases would increase. There were increases in doctor's utilization and patient's time, but these were not significant.

The second run increased all rates to five percent. This change had the opposite effect of the previous run, by decreasing the ancillary personnel utilization slightly. Doctor's utilization again increased, but this time the increase was significant. The night doctor's utilization was doubled to twenty percent. This would cause the doctor on call to be busy one-fifth of the time.

The number of emergencies cannot be controlled, but these two runs show that the emergency rate can vary and have little effect on the clinic operation. The major variation brought by changing this rate is with the night doctor. Any substantial increase greater than the five percent emergency rate would cause too many interruptions in the clinic operation.

c. Day Emergency Time Distribution

The model used an average time of forty minutes for emergencies which occurred during the clinic office hours. This distribution was assumed to be exponential. One run was made changing this to an uniform distribution (all times between ten and seventy minutes are equally likely). No significant changes in system performance resulted.

d. Pediatric Rate

Two simulations were made using different occurrence rates in the pediatric specialty area. All occurrence rates in the model are averages of a one year period. Pediatrics was the only area which seemed to fluxuate significantly. One run was made using the highest quarter's occurrence rate and another using the lowest quarter's rate. Changing this rate to either extreme had no significant effect upon the model. (Table 9a).

e. Walk-in Rate

The walk-in rate is the percentage of all patients who came directly to the office without calling ahead for an appointment. The walk-in rate for the model was fifteen percent. Three runs (Table 9a) were made to test the model at a rate less than fifteen and up to the fifty percent rate which is now experienced in the General Medical Clinic.

At a walk-in rate of five percent, ninety-five percent of the non-emergency patients were calling for

an appointment. At this rate the system could not handle all who called, therefore, the waiting time to obtain an appointment grew excessively. The number of patients waiting grew to the point where the simulation was stopped, (transaction count exceeded). Data was therefore only available for one month. Doctor's utilization decreased but ancillary personnel utilization remained about the same. Although patients had to wait long periods of time to get into the clinic, their time spent in the clinic decreased and their utilization increased. This low walk-in rate allows the clinic to plan better, and would allow more patients to be scheduled each day. If changes in scheduling policy were not made, the number of families served would be decreased.

Next the walk-in rate was changed to twenty-five percent. Patient's utilization dropped to twenty-seven percent, while the average waiting room time per patient increased ten minutes. The time patients spent in the clinic increased significantly to over one and one half hours. Although doctor's utilization remained approximately the same, their time spent in the clinic decreased.

The last run varying the walk-in rate was to test the fifty percent rate. The trends listed above continued (less patient utilization and more patient time in the clinic). The doctor's "time there" utilization remained the same, but his utilization, using scheduled time, decreased significantly. The doctor's time in the clinic

decreased even further. Higher walk-in rates cause the patient's time to be wasted by longer waiting periods.

f. No-Show Rate

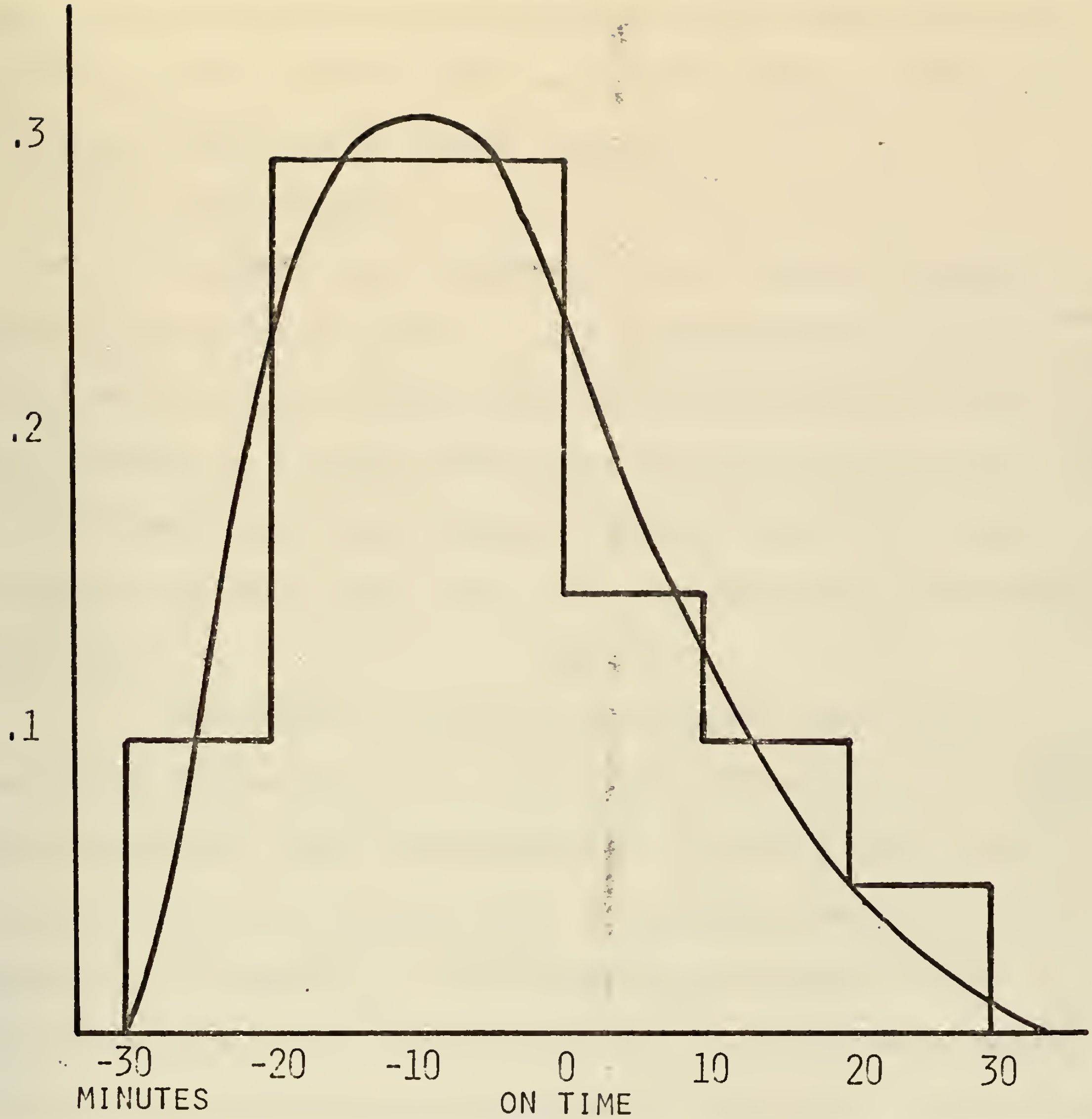
The no-show rate is the percentage of patients who have scheduled appointments but do not arrive. The no-show rate was increased to fifteen then twenty-five percent. The twenty-five percent run was not examined too closely, because the system overflowed at the fifteen percent rate. On the first run, doctor's utilization decreased. This shows that the system is very sensitive to an increase in the no-show rate. In this model every no-show patient was placed back into the system to be rescheduled. This would then cause a pile up to occur in those patients awaiting appointments, and leads to saturation of the system. If no-shows were not required to be rescheduled only the doctor's utilization would be affected.

g. Arrival Delays

The authors assumed that patients arrived for appointments according to a normal distribution centered about their scheduled time. Two other distributions were simulated. The first was uniform over the range of scheduled times plus or minus twenty-five minutes. The second used the distribution depicted in figure 4. Neither of these had any noticeable affect on any of the measures.

h. Nurse Clinician and Doctor Consults

The probability of a doctor having to consult with a nurse clinician was varied from one to twenty percent



CONTINUOUS DENSITY FROM REF. 5, DISCRETE USED IN MODEL.

ARRIVAL DENSITY

FIGURE 4.

(Table 9b). These runs did not affect any of the measures, therefore this parameter is not sensitive to changes in this range. The varying of the probability of a nurse clinician consulting with a doctor also had little effect. This rate was varied from five to twenty percent.

i. Exam Lengths

Although the length of time a patient spends with the doctor is critical to the operation of a clinic, one parameter which affects more personnel than any other is the length of a female exam that requires an observer. The basic model used an average of eight minutes per exam. Two other runs were made using five and ten minute averages (Table 9c).

The first run using five minute exam shows a significant decrease in the doctor's utilization, but with little effect on other utilizations. Doctor's time there utilization also decreased while the doctor time there remained fairly constant. This demonstrates that a three minute decrease in only thirty percent of the exams causes a substantial decrease in the doctor's time busy. According to the t-test the decrease in the patient's time in the clinic was not significant at the ninety-five percent confidence level.

The second run increased the female exam time to ten minutes. This change had the opposite and predictable effect. Doctor's utilization and time there utilization increased significantly. But the doctor's time in the clinic

PARAMETER	DOCTORS' UTILIZATION		PATIENT TIME		PATIENT	WAITING	APPENDIX
	Mean (%)	T-score	Mean (min)	T-score	UTILIZATION (%)	ROOM TIME (min)	RUN #
Basic	94.8	0	76.7	0	33	41	B-1
Arrivals							
Uniform	94.5	0.26	73.6	0.50	33	35	B-18
Gamma	95.5	0.45	74.3	0.40	34	35	B-19
Nurse Clinician Consult Rate							
1 %	94.1	0.42	71.2	0.92	35	33	B-23
10 %	95.2	0.21	81.0	0.78	31	41	B-24
20 %	95.9	0.81	75.5	0.28	34	35	B-25
Doctors' Consult Rate							
5 %	94.9	0.03	73.5	0.54	34	34	B-26
20 %	95.6	0.55	76.4	0.05	33	37	B-27

Table 9.b. Parameter Comparisons

PARAMETER	DOCTORS' UTILIZATION		PATIENT TIME		PATIENT	WAITING	APPENDIX
	Mean (%)	T-score	Mean (min)	T-score	UTILIZATION (%)	ROOM TIME (min)	RUN #
Female Exam							
5 Minutes	90.1	3.03*	67.0	1.66	36	30	B-28
10 Minutes	100.3	3.74*	78.9	0.36	33	37	B-29
Referral Rate							
5 %	95.3	1.67	74.6	1.11	34	36	B-30
25 %	100.3	2.04*	82.3	0.31	31	41	B-31
Nurse Return Rate							
10 %	96.7	1.12	80.0	0.54	32	40	B-32
25 %	102.4	5.07*	83.3	1.18	32	41	B-33
Lab Return Rate							
5 %	94.6	0.14	73.4	0.57	34	34	B-34
25 %	96.6	1.21	75.1	0.25	33	36	B-35
Basic	94.8	0	76.7	0	33	41	B-1

* Significant by t-test
(i.e. exceeded 1.76)

Table 9.c. Parameter Comparisons

also increased. These two runs show that the system is extremely sensitive to exam time. If the thirteen minute normal patient exam time were altered only slightly there would be a substantial effect on the entire system.

j. Referral Rate

Two computer runs were performed using five and twenty-five percent referral rate instead of the basic model's ten percent. At a five percent rate, small changes were noted. When the rate was increased to twenty-five percent changes did occur. A significant increase appeared in the doctor's utilization and time there utilization. This indicates that increases in the referral rate have some effect on the system, but they seem to be slight.

k. Returns to the Doctor

Runs were made on the percentage of returns from the nurse and the lab (Table 9c). When the return rate from the nurses was increased to ten percent only slight changes in the measures were detected. But when the return rate was increased to twenty-five percent the doctor's utilization increased significantly. Twenty-five percent returns from the nurse seems to be quite high. Any change in rate of less than five percent would have little effect on the system. Return rates from the lab were varied between five and twenty-five percent. These changes did not cause noticeable increases or decreases in any of the measures of effectiveness.

III. MODEL UTILIZATION

The model is designed to determine the number of families that could be served by a Family Practice team consisting of four doctors plus ancillary personnel. A secondary objective is to analyze the best mix of personnel and number of exam rooms needed. These were determined using the input data developed in Section II. A. and B. and estimates by personnel at Hays Hospital.

The number of personnel considered were as follows:

(1) Doctors - 4
(2) Nurse Clinicians - 1, 2, 3
(3) Nurses - 1, 2
(4) Nurse's Aides - 2, 3
(5) Laboratory Technician - 1
(6) Receptionists - 2, 3, 4

Also varied was the number of exam rooms:

(1) Doctor's - 1, 2, 3
(2) Nurse Clinician's - 1, 2

The number of families was also varied to determine the number to assign to each doctor. It was discovered that around three hundred and twenty would keep the system busy and keep average waiting time at an acceptable level (Table 10).

Using the estimates from personnel at Hays Hospital, the number of nurse clinicians was reduced to one. The

	320 Families per Patient Panel				335 Families per Patient Panel			
	Quarters				Quarters			
	First	Second	Third	Fourth	First	Second	Third	Fourth
Number of Patients Waiting on the Schedule at the End of Each Quarter	218	257	171	162	472	559	576	598
Doctors' Utilization	96%	95%	90%	92%	94%	99%	99%	101%
Average Patients' Time in the Clinic (Minutes)	80	75	74	74	79	81	81	85
Average Waiting Time once Scheduled (Days)	4.9	5.0	4.9	4.8	7.5	8.6	9.5	10.4

TABLE 10. EFFECT OF VARYING PATIENT PANEL SIZE

utilization of the one nurse clinician doubled (Tables 11a and 11b), but still is well below any critical value. The usefullness of nurse clinicians seems to be restricted by the small portion of problems they are allowed to handle. An increase to three nurse clinicians at these rates would not increase the efficiency of the clinic. In later runs a change in the portion of problems handled by nurse clinicians was investigaged, and these results will be covered later.

Due to the set up of the clinic and the overlapping nature of duties performed by nurses and aides, nurses' busy time is very low. Cutting the number to one nurse had little effect on the running of the clinic. This is caused by the fact that in the model, aides were selected as observers for female exams before nurses. If nurses were used to escort patients to exam rooms, the decrease of one nurse could be considered as a decrease of one nurse or one aide.

The next change made was to decrease the number of aides to one. This increased the aide's utilization but a significant increase was noted in the average time spent at the clinic by the patient, and a consequent decrease in the patient's utilization. This increase in patient's time was quite significant according to the t-test. Even though the aide's utilization increased a great deal, the nurse's did not seem to increase correspondingly. This shows that more of the aide's time is spent in showing patients to exam rooms than spent in observing female exams. Therefore it would be helpful if nurses were tasked along with aides in this area.

PARAMETER	DOCTORS' UTILIZATION		PATIENT TIME		PATIENT UTILIZATION	WAITING ROOM TIME	REMARKS & APPENDIX RUN #
	Mean (%)	T-score	Mean (min)	T-score	(%)	(min)	
Basic	94.8	0	76.7	0	33	41	Receptionists' Utilization 40%, 24%, and 15% B-1
Three Exam Rooms	95.3	0.35	74.8	0.30	33	27	Time in Exam Rooms Increased B-2
12 Appointment Periods	98.8	2.77*	73.4	0.56	34	34	B-3
Receptionists on Duty During the Day							
Two	93.7	0.69	81.2	0.67	-	-	Recept. Util. 46% and 32% B-14
One	95.7	0.43	100.0	4.34*	-	-	Recept. Util. 77% B-15

* Significant by t-test (i.e. exceeded 1.76)

Table 11.a. Parameter Comparisons

PARAMETER	DOCTORS' UTILIZATION		PATIENT TIME		PATIENT UTILIZATION (%)	WAITING ROOM TIME (MIN)	REMARKS & APPENDIX RUN #
	Mean (%)	T-SCORE	Mean (MIN)	T-SCORE			
Basic	94.8	0	76.7	0	33	41	Nurse Clinician Utilization 20% and 17%, Aides' Utilization 55% and 41% B-1
One Aide	94.6	0.19	121.3	6.49*	20	71	Aide Util. 83% B-20
One Nurse Clinician	93.5	0.99	74.7	0.30	33	37	Nurse Clinician Util. 40% B-22

* Significant by t-test
(i.e. exceeded 1.76)

Table 11.b. Parameter Comparisons

The need for a full time laboratory technician in a clinic is highly questionable. The number of patients assigned to only four doctors is not sufficient to keep a full time technician busy. Two alternatives are offered. The first is to train a nurse in some aspects of the technician's job. This would allow some laboratory work in the clinic and more complicated work could be sent to the main hospital laboratory. The second alternative is to assign a technician from the hospital for a short period of the day.

The last of the personnel varied was the receptionist. The night receptionist was kept constant and the day receptionists were reduced to two and then to one. When reduced to two, utilization increased but still within limits of acceptability. An increase of five minutes was noted in average patient time, but this is not a significant increase. When reduced to only one, the receptionist was busy most of the time (77%), but still not near a saturation point. The average patient time spent in the office increased significantly by almost twenty-five minutes. Doctor's time spent in the clinic also increased. This indicates that two day receptionists are needed.

The number of doctor exam rooms was varied with the expected results. One exam room per doctor caused a severe slow down of the system, decreased doctor utilization, and increased quitting time. Raising the number of exam rooms to three had little effect except in two areas. Waiting time in the outer office decreased, while waiting time in the exam

room for the doctor increased. The overall time spent in the clinic by the patient did not change. There seems to be little gained by giving each doctor three exam rooms.

Due to the low utilization of nurse clinicians, increasing their exam rooms would not afford much increase in efficiency. The change to two exam rooms for nurse clinicians will be discussed later.

The final change was to schedule twelve patients per doctor in the morning and afternoon periods of each day instead of the original ten. The effect of this was to increase the doctor's utilization and "time there" utilization. All other measures did not change significantly. This change could be helpful, if not carried too far. If the number of appointments were greatly increased, it could affect both the doctor's and patient's time spent in the clinic.

IV. RESULTS AND CONCLUSIONS

The model shows the optimal number of families to assign a doctor to be approximately three hundred and twenty. This is quite a bit under most estimates of the number that could be served [Ref. 4]. It is also a substantial decline from the number being served by the General Medicine Clinic. The three hundred and twenty figure is based on giving total medical service to a family and assumes that the family would not seek medical service from another clinic or doctor. The Family Practice Clinic would care for all of the patient's needs as they develop.

On the basis of parameter estimates, the optimal mix of personnel would be: four doctors, one nurse clinician, one nurse, three aides, and three receptionists. This is the best set up for a clinic which is separated from other medical services. Each doctor needs two exam rooms and the nurse clinician only one.

The above results are based on estimates given by supervisory personnel at Hays Hospital. From other sources estimates of a nurse clinician's responsibility are greater [Ref. 4]. Therefore, runs were conducted using differing nurse clinician rates (Appendix C).

Runs covering one year were made to discover the optimal number of families that could be assigned under different parameters. The model with the three hundred and twenty

families was the first run for the one year period. The results of this run are used to compare the increases realized by varying the nurse clinician's responsibility. This one year run had similar results to the basic run used in the previous comparisons.

The first change was to increase the nurse clinician's responsibility to a level where the clinician could care for a minimum of twelve percent of all patients. The level in several specific areas was also increased (pediatrics-50%, allergies and immunizations-60%, OB/GYN-40%, patients over fifty-five-50%). The larger increases in these areas are a result of training received by the nurse clinicians. The two nurse clinicians should be trained in different areas so that as a group they can handle a larger proportion of problems. In this run, it was discovered that the nurse clinician's utilization increased to an acceptable rate. A bottleneck now appeared in the exam room of the nurse clinician, so this was increased to two exam rooms each.

With these changes a doctor was now able to care for four-hundred and twenty families. Doctor's utilization increased slightly as did all ancillary personnel's utilization (Appendix C). The major increase occurred in the nurse clinician's utilization to 73 percent. A slight increase was noted in patient's time in the clinic and a decrease in patient's utilization. These small changes for the patients are heavily outweighed by the increased number of patients served.

The greater utilization of nurse clinicians is a very important area. In a four doctor clinic, this caused a total increase of four-hundred and twenty families. This effectively is an increase of another doctor for the clinic, where the only change was better utilization of nurse clinicians.

Another simulation was performed, increasing the nurse clinician's rate again. This time the overall rate was increased to a minimum of fifteen percent. The rates in several specific areas were again increased (pediatrics-60%, allergy and immunizations-75%, OB/GYN-50% and patients over fifty-five-60%). This increase required the addition of a third nurse clinician and an extra aide or nurse to assist the night aide. With these changes, the utilization of all personnel increased and a doctor was now able to care for five hundred families. The patient's time in the clinic again increased and his utilization decreased.

V. RECOMMENDATIONS

The key to the Family Practice Clinic being able to provide total medical care for more families lies in increased utilization of the nurse clinicians. If a single doctor can care for only three hundred and twenty families, it will require eighty-eight Family Practice Physicians to care for the 28,000 families of the Hays Hospital potential patient population. These eighty-eight doctors do not include the other specialists in the hospital. If a doctor cares for five hundred families, however, only fifty-six Family Practice Physicians will be required. Since the shortage of doctors has been predicted to continue [Ref. 4], the increased utilization of ancillary personnel is imperative.

The model can be improved by the collection of data to provide more accurate estimates of the parameters listed in Table 10.

The model presented in this thesis can be used to simulate almost any group-doctor situation with a few minor changes.

APPENDIX A FIRST BASIC RUN (A-1)

Length of run 3 months

UTILIZATION	Scheduled Times	Time There
Doctor 1	95%	84%
Doctor 2	90%	84%
Doctor 3	93%	83%
Doctor 4	99%	88%
Nurse Clin. 1	20%	
Nurse Clin. 2	16%	
Nurse Clin. 3	- %	
Night Doctor	8%	
Night Recept.	36%	
Patients		34%

UTILIZATION	Scheduled Times
Recept. 1	39%
Recept. 2	23%
Recept. 3	15%
Nurse 1	7%
Nurse 2	17%
Night Aide	48%
Aide 1	53%
Aide 2	41%
Lab. Tech.	12%

Average Waiting Room Time 35 min.

Scheduled 18 min. Call-ahead 45 min. Walk-ins 112 min.

t-Test

	Mean	Std. Dev.	t-Score
Util_{TS}	94.22 %	3.32	0
Util_{TT}	84.64 %	2.16	0
Patient's Time	74.15 min.	9.64	0
Doctor's Time*	28,748 min.	503.1	0

* Time in clinic during the number of months noted above.

SECOND BASIC RUN (A-2)

Length of run 3 months

	UTILIZATION			UTILIZATION
	Scheduled Times	Time There		Scheduled Times
Doctor 1	98%	84%	Recept. 1	40%
Doctor 2	92%	81%	Recept. 2	24%
Doctor 3	96%	84%	Recept. 3	15%
Doctor 4	95%	87%	Nurse 1	8%
Nurse Clin. 1	19%		Nurse 2	18%
Nurse Clin. 2	16%		Night Aide	48%
Nurse Clin. 3	- %		Aide 1	55%
Night Doctor	8%		Aide 2	40%
Night Recept.	35%		Lab. Tech.	11%
Patients		33%		

Average Waiting Room Time 50 min.

Scheduled 21 min. Call-ahead 51 min. Walk-ins 162 min.

t-Test

	Mean	Std. Dev.	t-Score
Util_{TS}	94.96 %	2.17	0.32
Util_{TT}	83.92 %	2.08	0.41
Patient's Time	75.99 min.	6.74	0.27
Doctor's Time*	29,278 min.	386.2	1.31

* Time in clinic during the number of months noted above.

Third Basic Run (A-3)

Length of run 3 months

UTILIZATION	Scheduled Times	Time There
Doctor 1	95%	85%
Doctor 2	94%	85%
Doctor 3	96%	84%
Doctor 4	96%	86%
Nurse Clin. 1	20%	
Nurse Clin. 2	19%	
Nurse Clin. 3	- %	
Night Doctor	10%	
Night Recept.	35%	
Patients		32%

UTILIZATION	Scheduled Times
Recept. 1	41%
Recept. 2	24%
Recept. 3	16%
Nurse 1	8%
Nurse 2	19%
Night Aide	50%
Aide 1	57%
Aide 2	42%
Lab. Tech.	13%

Average Waiting Room Time 37 min.

Scheduled 21 min. Call-ahead 51 min. Walk-ins 112 min.

t-Test

	Mean	Std. Dev.	t-Score
Util_{TS}	95.28 %	1.08	0.53
Util_{TT}	85.18 %	0.87	0.40
Patient's Time	79.80 min.	12.11	0.63
Doctor's Time*	28,893 min.	152.1	0.48

* Time in clinic during the number of months noted above.

APPENDIX B BASIC (B-1)

LENGTH OF RUN 3 MONTHS

UTILIZATION

	SCHEDULED TIMES	TIME THERE
DOCTOR 1	96%	84%
DOCTOR 2	92%	83%
DOCTOR 3	95%	84%
DOCTOR 4	97%	87%
NURSE CLIN. 1	20%	
NURSE CLIN. 2	17%	
NURSE CLIN. 3	- %	
NIGHT DOCTOR	9%	
NIGHT RECEPT.	35%	
PATIENTS		33%

UTILIZATION

	SCHEDULED TIMES
RECEPT. 1	40%
RECEPT. 2	24%
RECEPT. 3	15%
NURSE 1	7%
NURSE 2	18%
NIGHT AIDE	49%
AIDE 1	55%
AIDE 2	41%
LAB. TECH.	12%

AVERAGE WAITING ROOM TIME 41 MIN.

SCHEDULED 21 MIN. CALL-AHEAD 49 MIN. WALK-INS 129 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	94.82 %	2.42	0
UTIL_{TT}	84.58 %	1.87	0
PATIENT'S TIME	76.65 MIN.	10.03	0
DOCTOR'S TIME*	28,956 MIN.	426.8	0

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

THREE EXAM ROOMS (B-2)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE
DOCTOR 1	94%	81%
DOCTOR 2	91%	84%
DOCTOR 3	95%	84%
DOCTOR 4	97%	88%
NURSE CLIN. 1	23%	
NURSE CLIN. 2	18%	
NURSE CLIN. 3	- %	
NIGHT DOCTOR	9%	
NIGHT RECEPT.	36%	
PATIENTS		33%

UTILIZATION	SCHEDULED TIMES
RECEPT. 1	40%
RECEPT. 2	23%
RECEPT. 3	15%
NURSE 1	8%
NURSE 2	17%
NIGHT AIDE	47%
AIDE 1	55%
AIDE 2	40%
LAB. TECH.	-%

AVERAGE WAITING ROOM TIME 27 MIN.

SCHEDULED 13 MIN. CALL-AHEAD 43 MIN. WALK-INS 82 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	95.29 %	1.17	0.35
UTIL_{TT}	84.23 %	2.39	0.28
PATIENT'S TIME	74.79 MIN.	9.92	0.30
DOCTOR'S TIME*	28,920 MIN.	467.2	0.13

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

12 APPOINTMENT PERIODS (B-3)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE
DOCTOR 1	100%	86%
DOCTOR 2	95%	87%
DOCTOR 3	101%	89%
DOCTOR 4	99%	90%
NURSE CLIN. 1	20%	
NURSE CLIN. 2	18%	
NURSE CLIN. 3	- %	
NIGHT DOCTOR	10%	
NIGHT RECEPT.	39%	
PATIENTS		34%

UTILIZATION	SCHEDULED TIMES
RECEPT. 1	40%
RECEPT. 2	23%
RECEPT. 3	15%
NURSE 1	8%
NURSE 2	17%
NIGHT AIDE	53%
AIDE 1	57%
AIDE 2	41%
LAB. TECH.	-%

AVERAGE WAITING ROOM TIME 34 MIN.

SCHEDULED 20 MIN. CALL-AHEAD 41 MIN. WALK-INS 103 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	98.79 %	2.02	2.77
UTIL_{TT}	87.85 %	1.46	2.97
PATIENT'S TIME	73.42 MIN.	7.23	0.56
DOCTOR'S TIME*	29.048 MIN.	497.7	0.34

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

20% OVER 1 APPOINTMENT PERIOD (B-4)

LENGTH OF RUN 3 MONTHS

	UTILIZATION			UTILIZATION
	SCHEDULED TIMES	TIME THERE		SCHEDULED TIMES
DOCTOR 1	97%	86%	RECEPT. 1	- %
DOCTOR 2	98%	88%	RECEPT. 2	- %
DOCTOR 3	98%	86%	RECEPT. 3	- %
DOCTOR 4	100%	90%	NURSE 1	- %
NURSE CLIN. 1	21%		NURSE 2	- %
NURSE CLIN. 2	20%		NIGHT AIDE	- %
NURSE CLIN. 3	- %		AIDE 1	- %
NIGHT DOCTOR	- %		AIDE 2	- %
NIGHT RECEPT.	- %		LAB. TECH.	- %
PATIENTS		30%		

AVERAGE WAITING ROOM TIME 40 MIN.

SCHEDULED - MIN. CALL-AHEAD - MIN. WALK-INS - MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	98.25 %	0.90	2.60
UTIL_{TT}	87.48 %	1.64	2.59
PATIENT'S TIME	83.17 MIN.	5.72	1.16
DOCTOR'S TIME*	29,010 MIN.	92.5	0.42

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

3% OVER 1 APPOINTMENT PERIOD (B-5)

Length of run 3 months

UTILIZATION	Scheduled Times	Time There	UTILIZATION	Scheduled Times
Doctor 1	81%	74%	Recept. 1	- %
Doctor 2	74%	71%	Recept. 2	- %
Doctor 3	84%	78%	Recept. 3	- %
Doctor 4	80%	77%	Nurse 1	- %
Nurse Clin. 1	18%		Nurse 2	- %
Nurse Clin. 2	15%		Night Aide	- %
Nurse Clin. 3	- %		Aide 1	- %
Night Doctor	- %		Aide 2	- %
Night Recept.	- %		Lab. Tech.	- %
Patients		44%		

Average Waiting Room Time 24 min.

Scheduled - min. Call-ahead - min. Walk-ins - min.

t-Test

	Mean	Std. Dev.	t-Score
Util_{TS}	79.82 %	3.79	8.61
Util_{TT}	75.15 %	2.57	7.38
Patient's Time	55.77 min.	2.92	3.84
Doctor's Time*	27,420 min.	314.6	6.19

* Time in clinic during the number of months noted above.

1% EMERGENCY RATE (B-6)

Length of run 3 months

UTILIZATION	Scheduled Times	Time There
Doctor 1	99%	- %
Doctor 2	98%	- %
Doctor 3	94%	- %
Doctor 4	98%	- %
Nurse Clin. 1	23%	
Nurse Clin. 2	20%	
Nurse Clin. 3	- %	
Night Doctor	5%	
Night Recept.	- %	
Patients		32%

UTILIZATION	Scheduled Times
Recept. 1	- %
Recept. 2	- %
Recept. 3	- %
Nurse 1	8%
Nurse 2	18%
Night Aide	55%
Aide 1	58%
Aide 2	42%
Lab. Tech.	- %

Average Waiting Room Time 39 min.

Scheduled - min. Call-ahead - min. Walk-ins - min.

t-Test

	Mean	Std. Dev.	t-Score
Util_{TS}	97.09 %	1.95	1.60
Util_{TT}	- %	-	-
Patient's Time	77.85 min.	6.80	0.21
Doctor's Time*	- min.	-	-

* Time in clinic during the number of months noted above.

5% EMERGENCY RATE (B-7)

LENGTH OF RUN 3 MONTHS

UTILIZATION

	SCHEDULED TIMES	TIME THERE
DOCTOR 1	99%	- %
DOCTOR 2	96%	- %
DOCTOR 3	98%	- %
DOCTOR 4	97%	- %
NURSE CLIN. 1	20%	
NURSE CLIN. 2	18%	
NURSE CLIN. 3	- %	
NIGHT DOCTOR	21%	
NIGHT RECEPT.	- %	
PATIENTS		32%

UTILIZATION

	SCHEDULED TIMES
RECEPT. 1	- %
RECEPT. 2	- %
RECEPT. 3	- %
NURSE 1	7%
NURSE 2	17%
NIGHT AIDE	54%
AIDE 1	56%
AIDE 2	40%
LAB. TECH.	- %

AVERAGE WAITING ROOM TIME 38 MIN.

SCHEDULED - MIN. CALL-AHEAD - MIN. WALK-INS - MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	97.37 %	1.11	1.91
UTIL_{TT}	- %	-	-
PATIENT'S TIME	78.43 MIN.	6.25	0.31
DOCTOR'S TIME*	- MIN.	-	-

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

UNIFORM DAY EMERGENCY TIME (B-8)

LENGTH OF RUN 3 MONTHS

	UTILIZATION			UTILIZATION
	SCHEDULED TIMES	TIME THERE		SCHEDULED TIMES
DOCTOR 1	98%	- %	RECEPT. 1	- %
DOCTOR 2	92%	- %	RECEPT. 2	- %
DOCTOR 3	95%	- %	RECEPT. 3	- %
DOCTOR 4	96%	- %	NURSE 1	- %
NURSE CLIN. 1	19%		NURSE 2	- %
NURSE CLIN. 2	16%		NIGHT AIDE	- %
NURSE CLIN. 3	- %		AIDE 1	- %
NIGHT DOCTOR	- %		AIDE 2	- %
NIGHT RECEPT.	- %		LAB. TECH.	- %
PATIENTS		35%		

AVERAGE WAITING ROOM TIME 34 MIN.

SCHEDULED - MIN. CALL-AHEAD - MIN. WALK-INS - MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	95.15 %	1.91	0.23
UTIL_{TT}	- %	-	-
PATIENT'S TIME	72.13 MIN.	7.29	0.78
DOCTOR'S TIME*	- MIN.	-	-

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

HIGHEST PEDIATRIC RATE (B-9)

Length of run 3 months

UTILIZATION	Scheduled Times	Time There	UTILIZATION	Scheduled Times
Doctor 1	91%	- %	Recept. 1	40%
Doctor 2	96%	- %	Recept. 2	23%
Doctor 3	95%	- %	Recept. 3	15%
Doctor 4	93%	- %	Nurse 1	6%
Nurse Clin. 1	21%		Nurse 2	17%
Nurse Clin. 2	18%		Night Aide	50%
Nurse Clin. 3	- %		Aide 1	55%
Night Doctor	9%		Aide 2	40%
Night Recept.	35%		Lab. Tech.	- %
Patients		34%		

Average Waiting Room Time 35 min.

Scheduled 19 min. Call-ahead 53 min. Walk-ins 100 min.

T-Test

	Mean	Std. Dev.	T-Score
Util$_{TS}$	93.68 %	1.90	0.80
Util$_{TT}$	- %	-	-
Patient's Time	73.69 min.	6.84	0.51
Doctor's Time*	- min.	-	-

* Time in clinic during the number of months noted above.

LOWEST PEDIATRIC RATE (B-10)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE	UTILIZATION	SCHEDULED TIMES
DOCTOR 1	93%	- %	RECEPT. 1	40%
DOCTOR 2	98%	- %	RECEPT. 2	23%
DOCTOR 3	93%	- %	RECEPT. 3	15%
DOCTOR 4	93%	- %	NURSE 1	8%
NURSE CLIN. 1	21%		NURSE 2	18%
NURSE CLIN. 2	20%		NIGHT AIDE	48%
NURSE CLIN. 3	- %		AIDE 1	52%
NIGHT DOCTOR	11%		AIDE 2	41%
NIGHT RECEPT.	35%		LAB. TECH.	- %
PATIENTS		33%		

AVERAGE WAITING ROOM TIME 37 MIN.

SCHEDULED 22 MIN. CALL-AHEAD 49 MIN. WALK-INS 102 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
$UTIL_{TS}$	94.15 %	2.30	0.46
$UTIL_{TT}$	- %	-	-
PATIENT'S TIME	75.07 MIN.	8.49	0.26
DOCTOR'S TIME*	- MIN.	-	-

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

5% WALK-INS (B-11)

LENGTH OF RUN 1 MONTH

UTILIZATION	SCHEDULED TIMES	TIME THERE	UTILIZATION	SCHEDULED TIMES
DOCTOR 1	87%	78%	RECEPT. 1	41%
DOCTOR 2	82%	74%	RECEPT. 2	24%
DOCTOR 3	83%	75%	RECEPT. 3	15%
DOCTOR 4	84%	75%	NURSE 1	8%
NURSE CLIN. 1	24%		NURSE 2	15%
NURSE CLIN. 2	21%		NIGHT AIDE	42%
NURSE CLIN. 3	- %		AIDE 1	52%
NIGHT DOCTOR	13%		AIDE 2	38%
NIGHT RECEPT.	36%		LAB. TECH.	- %
PATIENTS		41%		

AVERAGE WAITING ROOM TIME 23 MIN.

SCHEDULED 17 MIN. CALL-AHEAD 36 MIN. WALK-INS 91 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	- %	-	-
UTIL_{TT}	- %	-	-
PATIENT'S TIME	- MIN.	-	-
DOCTOR'S TIME*	- MIN.	-	-

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

25% WALK-INS (B-12)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE
DOCTOR 1	100%	89%
DOCTOR 2	94%	87%
DOCTOR 3	93%	83%
DOCTOR 4	92%	85%
NURSE CLIN. 1	20%	
NURSE CLIN. 2	16%	
NURSE CLIN. 3	- %	
NIGHT DOCTOR	10%	
NIGHT RECEPT.	32%	
PATIENTS		27%

UTILIZATION	SCHEDULED TIMES
RECEPT. 1	39%
RECEPT. 2	22%
RECEPT. 3	14%
NURSE 1	7%
NURSE 2	18%
NIGHT AIDE	52%
AIDE 1	55%
AIDE 2	41%
LAB. TECH.	- %

AVERAGE WAITING ROOM TIME 51 MIN.

SCHEDULED 21 MIN. CALL-AHEAD 47 MIN. WALK-INS 133 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	95.11 %	3.19	0.18
UTIL_{TT}	86.13 %	2.40	1.25
PATIENT'S TIME	92.20 MIN.	10.10	2.51
DOCTOR'S TIME*	28,515 MIN.	216.9	1.85

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

50% WALK-INS (B-13)

LENGTH OF RUN 3 MONTHS

	UTILIZATION			UTILIZATION
	SCHEDULED TIMES	TIME THERE		SCHEDULED TIMES
DOCTOR 1	94%	83%	RECEPT. 1	34%
DOCTOR 2	94%	87%	RECEPT. 2	18%
DOCTOR 3	87%	80%	RECEPT. 3	11%
DOCTOR 4	93%	88%	NURSE 1	5%
NURSE CLIN. 1	19%		NURSE 2	16%
NURSE CLIN. 2	18%		NIGHT AIDE	56%
NURSE CLIN. 3	- %		AIDE 1	54%
NIGHT DOCTOR	10%		AIDE 2	38%
NIGHT RECEPT.	26%		LAB. TECH.	- %
PATIENTS		22%		

AVERAGE WAITING ROOM TIME 71 MIN.

SCHEDULED 19 MIN. CALL-AHEAD 31 MIN. WALK-INS 125 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
$UTIL_{TS}$	91.81 %	2.97	1.90
$UTIL_{TT}$	84.35 %	3.27	0.16
PATIENT'S TIME	112.83 MIN.	33.34	3.12
DOCTOR'S TIME*	28,125 MIN.	597.9	2.83

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

2 DAY RECEPTIONISTS (B-14)

Length of run 3 months

UTILIZATION

	Scheduled Times	Time There
Doctor 1	89%	80%
Doctor 2	95%	85%
Doctor 3	93%	82%
Doctor 4	98%	86%
Nurse Clin. 1	19%	
Nurse Clin. 2	19%	
Nurse Clin. 3	- %	
Night Doctor	- %	
Night Recept.	- %	

UTILIZATION

	Scheduled Times
Recept. 1	46%
Recept. 2	32%
Recept. 3	- %
Nurse 1	- %
Nurse 2	- %
Night Aide	- %
Aide 1	- %
Aide 2	- %
Lab. Tech.	- %

Average Waiting Room Time - min.

Scheduled - min. Call-ahead - min. Walk-ins - min.

T-Test

	Mean	Std. Dev.	T-Score
Util$_{TS}$	93.68 %	3.31	0.69
Util$_{TT}$	83.26 %	2.55	1.04
Patient's Time	81.17 min.	13.49	0.67
Doctor's Time*	29,069 min.	437.5	0.39

* Time in clinic during the number of months noted above.

1 Day Receptionist (B-15)

Length of run 3 months

UTILIZATION

	Scheduled Times	Time There
Doctor 1	95%	85%
Doctor 2	96%	85%
Doctor 3	103%	87%
Doctor 4	88%	79%
Nurse Clin. 1	20%	
Nurse Clin. 2	17%	
Nurse Clin. 3	- %	
Night Doctor	- %	
Night Recept.	36%	

UTILIZATION

	Scheduled Times
Recept. 1	77%
Recept. 2	- %
Recept. 3	- %
Nurse 1	- %
Nurse 2	- %
Night Aide	- %
Aide 1	- %
Aide 2	- %
Lab. Tech.	- %

Average Waiting Room Time - min.

Scheduled - min. Call-ahead - min. Walk-ins - min.

t-Test

	Mean	Std. Dev.	t-Score
Util_{TS}	95.67 %	4.87	0.43
Util_{TT}	83.77 %	3.13	0.58
Patient's Time	99.97 min.	1.74	4.34
Doctor's Time*	29,453 min.	484.8	1.82

* Time in clinic during the number of months noted above.

15% NO SHOWS (B-16)

Length of run 1 months

	UTILIZATION			UTILIZATION
	Scheduled Times	Time There		Scheduled Times
Doctor 1	89%	77%	Recept. 1	40%
Doctor 2	90%	81%	Recept. 2	24%
Doctor 3	84%	77%	Recept. 3	16%
Doctor 4	81%	75%	Nurse 1	6%
Nurse Clin. 1	19%		Nurse 2	16%
Nurse Clin. 2	21%		Night Aide	42%
Nurse Clin. 3	- %		Aide 1	55%
Night Doctor	11%		Aide 2	37%
Night Recept.	35%		Lab. Tech.	- %
Patients		37%		

Average Waiting Room Time 30 min.

Scheduled 17 min. Call-ahead 42 min. Walk-ins 78 min.

T-Test

	Mean	Std. Dev.	T-Score
Util_{TS}	- %	-	-
Util_{TT}	- %	-	-
Patient's Time	- min.	-	-
Doctor's Time*	- min.	-	-

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* Time in clinic during the number of months noted above.

25% NO SHOWS (B-17)

LENGTH OF RUN 1 MONTHS

	UTILIZATION			UTILIZATION
	SCHEDULED TIMES	TIME THERE		SCHEDULED TIMES
DOCTOR 1	83%	73%	RECEPT. 1	42%
DOCTOR 2	77%	74%	RECEPT. 2	24%
DOCTOR 3	78%	68%	RECEPT. 3	15%
DOCTOR 4	86%	80%	NURSE 1	7%
NURSE CLIN. 1	21%		NURSE 2	15%
NURSE CLIN. 2	19%		NIGHT AIDE	38%
NURSE CLIN. 3	- %		AIDE 1	52%
NIGHT DOCTOR	10%		AIDE 2	37%
NIGHT RECEPT.	36%		LAB. TECH.	- %
PATIENTS		37%		

AVERAGE WAITING ROOM TIME - MIN.

SCHEDULED - MIN. CALL-AHEAD - MIN. WALK-INS - MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	- %	-	-
UTIL_{TT}	- %	-	-
PATIENT'S TIME	- MIN.	-	-
DOCTOR'S TIME*	- MIN.	-	-

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

UNIFORM ARRIVALS (B-18)

Length of run 3 months

UTILIZATION

	Scheduled Times	Time There
Doctor 1	94%	83%
Doctor 2	95%	86%
Doctor 3	93%	82%
Doctor 4	96%	87%
Nurse Clin. 1	21%	
Nurse Clin. 2	18%	
Nurse Clin. 3	- %	
Night Doctor	- %	
Night Recept.	- %	
Patients		33%

UTILIZATION

	Scheduled Times
Recept. 1	- %
Recept. 2	- %
Recept. 3	- %
Nurse 1	- %
Nurse 2	- %
Night Aide	- %
Aide 1	- %
Aide 2	- %
Lab. Tech.	- %

Average Waiting Room Time 35 min.

Scheduled - min. Call-ahead - min. Walk-ins - min.

T-Test

	Mean	Std. Dev.	T-Score
Util_{TS}	94.47 %	1.09	0.26
Util_{TT}	84.74 %	2.02	0.14
Patient's Time	73.57 min.	9.60	0.50
Doctor's Time*	28,800 min.	99.5	0.68

* Time in clinic during the number of months noted above.

GAMMA ARRIVALS (B-19)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE	UTILIZATION	SCHEDULED TIMES
DOCTOR 1	93%	83%	RECEPT. 1	- %
DOCTOR 2	97%	87%	RECEPT. 2	- %
DOCTOR 3	99%	86%	RECEPT. 3	- %
DOCTOR 4	94%	86%	NURSE 1	- %
NURSE CLIN. 1	21%		NURSE 2	- %
NURSE CLIN. 2	16%		NIGHT AIDE	- %
NURSE CLIN. 3	- %		AIDE 1	- %
NIGHT DOCTOR	- %		AIDE 2	- %
NIGHT RECEPT.	- %		LAB. TECH.	- %
PATIENTS		34%		

AVERAGE WAITING ROOM TIME 35 MIN.

SCHEDULED - MIN. CALL-AHEAD - MIN. WALK-INS - MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	95.49 %	2.33	0.45
UTIL_{TT}	85.63 %	1.48	0.95
PATIENT'S TIME	74.32 MIN.	7.95	0.40
DOCTOR'S TIME*	28,800 MIN.	277.4	0.64

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

1 AIDE (B-20)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE	UTILIZATION	SCHEDULED TIMES
DOCTOR 1	94%	82%	RECEPT. 1	40%
DOCTOR 2	94%	84%	RECEPT. 2	24%
DOCTOR 3	92%	82%	RECEPT. 3	15%
DOCTOR 4	98%	86%	NURSE 1	7%
NURSE CLIN. 1	20%		NURSE 2	18%
NURSE CLIN. 2	17%		NIGHT AIDE	70%
NURSE CLIN. 3	- %		AIDE 1	83%
NIGHT DOCTOR	10%		AIDE 2	- %
NIGHT RECEPT.	36%		LAB. TECH.	- %
PATIENTS		20%		

AVERAGE WAITING ROOM TIME 71 MIN.

SCHEDULED 39 MIN. CALL-AHEAD 135 MIN. WALK-INS 183 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL$_{TS}$	94.55 %	2.08	0.19
UTIL$_{TT}$	83.30 %	1.94	1.09
PATIENT'S TIME	121.28 MIN.	13.96	6.49
DOCTOR'S TIME*	29,318 MIN.	305.5	1.47

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* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

1 NURSE (B-21)

Length of run 6 months

	UTILIZATION			UTILIZATION
	Scheduled Times	Time There		Scheduled Times
Doctor 1	-%	-%	Recept. 1	-%
Doctor 2	-%	-%	Recept. 2	-%
Doctor 3	-%	-%	Recept. 3	-%
Doctor 4	-%	-%	Nurse 1	20%
Nurse Clin. 1	-%		Nurse 2	-%
Nurse Clin. 2	-%		Night Aide	51%
Nurse Clin. 3	-%		Aide 1	56%
Night Doctor	-%		Aide 2	41%
Night Recept.	-%		Lab. Tech.	-%
Patients		32%		

Average Waiting Room Time 39 min.

Scheduled - min. Call-ahead - min. Walk-ins - min.

T-Test

	Mean	Std. Dev.	T-Score
Util_{TS}	- %	-	-
Util_{TT}	- %	-	-
Patient's Time	- min.	-	-
Doctor's Time*	- min.	-	-

* Time in clinic during the number of months noted above.

1 NURSE CLINICIAN (B-22)

Length of run 3 months

	UTILIZATION			UTILIZATION
	Scheduled Times	Time There		Scheduled Times
Doctor 1	93%	81%	Recept. 1	-%
Doctor 2	93%	83%	Recept. 2	-%
Doctor 3	93%	84%	Recept. 3	-%
Doctor 4	95%	85%	Nurse 1	7%
Nurse Clin. 1	40%		Nurse 2	17%
Nurse Clin. 2	-%		Night Aide	51%
Nurse Clin. 3	-%		Aide 1	52%
Night Doctor	-%		Aide 2	41%
Night Recept.	-%		Lab. Tech.	-%
Patients		33%		

Average Waiting Room Time 37 min.

Scheduled - min. Call-ahead - min. Walk-ins - min.

T-Test

	Mean	Std. Dev.	T-Score
Util_{TS}	93.52 %	0.86	0.99
Util_{TT}	83.13 %	1.33	1.34
Patient's Time	74.69 min.	12.43	0.30
Doctor's Time*	29,063 min.	399.3	0.41

* Time in clinic during the number of months noted above.

1% NURSE CLINICIAN CONSULTS (B-23)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE
DOCTOR 1	99%	86%
DOCTOR 2	96%	89%
DOCTOR 3	92%	82%
DOCTOR 4	90%	82%
NURSE CLIN. 1	17%	
NURSE CLIN. 2	16%	
NURSE CLIN. 3	- %	
NIGHT DOCTOR	- %	
NIGHT RECEPT.	- %	
PATIENTS		35%

UTILIZATION	SCHEDULED TIMES
RECEPT. 1	- %
RECEPT. 2	- %
RECEPT. 3	- %
NURSE 1	- %
NURSE 2	- %
NIGHT AIDE	- %
AIDE 1	- %
AIDE 2	- %
LAB. TECH.	- %

AVERAGE WAITING ROOM TIME 33 MIN.

SCHEDULED 19 MIN. CALL-AHEAD 48 MIN. WALK-INS 92 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	94.13 %	3.40	0.42
UTIL_{TT}	84.45 %	3.06	0.09
PATIENT'S TIME	71.20 MIN.	7.91	0.92
DOCTOR'S TIME*	28,793 MIN.	523.7	0.58

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

10% NURSE CLINICIAN CONSULTS (B-24)

LENGTH OF RUN 3 MONTHS

UTILIZATION

	SCHEDULED TIMES	TIME THERE
DOCTOR 1	96%	85%
DOCTOR 2	94%	87%
DOCTOR 3	101%	88%
DOCTOR 4	90%	83%
NURSE CLIN. 1	25%	
NURSE CLIN. 2	18%	
NURSE CLIN. 3	- %	
NIGHT DOCTOR	- %	
NIGHT RECEPT.	- %	
PATIENTS		31%

UTILIZATION

	SCHEDULED TIMES
RECEPT. 1	- %
RECEPT. 2	- %
RECEPT. 3	- %
NURSE 1	- %
NURSE 2	- %
NIGHT AIDE	- %
AIDE 1	- %
AIDE 2	- %
LAB. TECH.	- %

AVERAGE WAITING ROOM TIME 41 MIN.

SCHEDULED 23 MIN. CALL-AHEAD 61 MIN. WALK-INS 117 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	95.18 %	3.83	0.21
UTIL_{TT}	85.79 %	1.85	1.05
PATIENT'S TIME	80.97 MIN.	4.89	0.78
DOCTOR'S TIME*	28,643 MIN.	432.3	1.19

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

20% NURSE CLINICIAN CONSULTS (B-25)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE	UTILIZATION	SCHEDULED TIMES
DOCTOR 1	96%	84%	RECEPT. 1	- %
DOCTOR 2	97%	87%	RECEPT. 2	- %
DOCTOR 3	96%	85%	RECEPT. 3	- %
DOCTOR 4	95%	88%	NURSE 1	- %
NURSE CLIN. 1	28%		NURSE 2	- %
NURSE CLIN. 2	20%		NIGHT AIDE	- %
NURSE CLIN. 3	- %		AIDE 1	- %
NIGHT DOCTOR	- %		AIDE 2	- %
NIGHT RECEPT.	- %		LAB. TECH.	- %
PATIENTS		34%		

AVERAGE WAITING ROOM TIME 35 MIN.

SCHEDULED 20 MIN. CALL-AHEAD 42 MIN. WALK-INS 105 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	95.88 %	0.84	0.81
UTIL_{TT}	86.12 %	1.61	1.38
PATIENT'S TIME	75.47 MIN.	6.51	0.28
DOCTOR'S TIME*	28,763 MIN.	343.6	0.77

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

5% DOCTORS' CONSULT (B-26)

Length of run 3 months

UTILIZATION	Scheduled Times	Time There
Doctor 1	96%	85%
Doctor 2	93%	86%
Doctor 3	96%	86%
Doctor 4	94%	85%
Nurse Clin. 1	18%	
Nurse Clin. 2	17%	
Nurse Clin. 3	- %	
Night Doctor	- %	
Night Recept.	- %	
Patients		34%

UTILIZATION	Scheduled Times
Recept. 1	- %
Recept. 2	- %
Recept. 3	- %
Nurse 1	- %
Nurse 2	- %
Night Aide	- %
Aide 1	- %
Aide 2	- %
Lab. Tech.	- %

Average Waiting Room Time 34 min.

Scheduled 18 min. Call-ahead 40 min. Walk-ins 108 min.

T-Test

	Mean	Std. Dev.	T-Score
Util_{TS}	94.85 %	1.43	0.03
Util_{TT}	85.48 %	0.44	0.89
Patient's Time	73.53 min.	7.08	0.54
Doctor's Time*	28,658 min.	247.7	1.24

* Time in clinic during the number of months noted above.

20% DOCTORS' CONSULTS (B-27)

LENGTH OF RUN 3 MONTHS

	UTILIZATION			UTILIZATION
	SCHEDULED TIMES	TIME THERE		SCHEDULED TIMES
DOCTOR 1	98%	84%	RECEPT. 1	- %
DOCTOR 2	98%	88%	RECEPT. 2	- %
DOCTOR 3	95%	87%	RECEPT. 3	- %
DOCTOR 4	92%	86%	NURSE 1	- %
NURSE CLIN. 1	21%		NURSE 2	- %
NURSE CLIN. 2	19%		NIGHT AIDE	- %
NURSE CLIN. 3	- %		AIDE 1	- %
NIGHT DOCTOR	- %		AIDE 2	- %
NIGHT RECEPT.	- %		LAB. TECH.	- %
PATIENTS		33%		

AVERAGE WAITING ROOM TIME 37 MIN.

SCHEDULED 21 MIN. CALL-AHEAD 49 MIN. WALK-INS 108 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL$_{TS}$	95.63 %	2.32	0.55
UTIL$_{TT}$	86.40 %	1.32	1.69
PATIENT'S TIME	76.36 MIN.	8.03	0.05
DOCTOR'S TIME*	28,590 MIN.	690.0	1.17

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

5 MINUTE FEMALE EXAM (B-28)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE	UTILIZATION	SCHEDULED TIMES
DOCTOR 1	92%	79%	RECEPT. 1	40%
DOCTOR 2	85%	79%	RECEPT. 2	24%
DOCTOR 3	93%	81%	RECEPT. 3	16%
DOCTOR 4	90%	82%	NURSE 1	6%
NURSE CLIN. 1	20%		NURSE 2	17%
NURSE CLIN. 2	16%		NIGHT AIDE	44%
NURSE CLIN. 3	- %		AIDE 1	58%
NIGHT DOCTOR	9%		AIDE 2	41%
NIGHT RECEPT.	34%		LAB. TECH.	- %
PATIENTS		36%		

AVERAGE WAITING ROOM TIME 30 MIN.

SCHEDULED - MIN. CALL-AHEAD - MIN. WALK-INS - MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	90.07 %	2.88	3.03
UTIL_{TT}	80.26 %	1.52	3.91
PATIENT'S TIME	67.04 MIN.	7.15	1.66
DOCTOR'S TIME*	28,988 MIN.	555.4	0.11

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

10 MINUTE FEMALE EXAM (B-29)

Length of run 3 months

UTILIZATION

	Scheduled Times	Time There
Doctor 1	101%	88%
Doctor 2	101%	91%
Doctor 3	102%	84%
Doctor 4	97%	87%
Nurse Clin. 1	20%	
Nurse Clin. 2	17%	
Nurse Clin. 3	- %	
Night Doctor	11%	
Night Recept.	37%	
Patients		33%

UTILIZATION

	Scheduled Times
Recept. 1	40%
Recept. 2	24%
Recept. 3	15%
Nurse 1	8%
Nurse 2	17%
Night Aide	52%
Aide 1	54%
Aide 2	41%
Lab. Tech.	- %

Average Waiting Room Time 37 min.

Scheduled - min. Call-ahead - min. Walk-ins - min.

T-Test

	Mean	Std. Dev.	T-Score
Util_{TS}	100.27 %	2.19	3.74
Util_{TT}	87.60 %	2.46	2.40
Patient's Time	78.85 min.	9.64	0.36
Doctor's Time*	29,580 min.	815.3	1.84

* Time in clinic during the number of months noted above.

5% REFERRALS (B-30)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE	UTILIZATION	SCHEDULED TIMES
DOCTOR 1	93%	82%	RECEPT. 1	40%
DOCTOR 2	95%	86%	RECEPT. 2	24%
DOCTOR 3	97%	85%	RECEPT. 3	15%
DOCTOR 4	96%	88%	NURSE 1	7%
NURSE CLIN. 1	22%		NURSE 2	18%
NURSE CLIN. 2	18%		NIGHT AIDE	47%
NURSE CLIN. 3	- %		AIDE 1	57%
NIGHT DOCTOR	10%		AIDE 2	42%
NIGHT RECEPT.	36%		LAB. TECH.	- %
PATIENTS		34%		

AVERAGE WAITING ROOM TIME 36 MIN.

SCHEDULED 21 MIN. CALL-AHEAD 47 MIN. WALK-INS 106 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	95.33 %	1.72	1.67
UTIL_{TT}	85.20 %	2.22	0.50
PATIENT'S TIME	74.63 MIN.	4.79	1.11
DOCTOR'S TIME*	28,905 MIN.	280.2	1.51

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

25% REFERRALS (B-31)

Length of run 3 months

	UTILIZATION			UTILIZATION
	Scheduled Times	Time There		Scheduled Times
Doctor 1	103%	90%	Recept. 1	39%
Doctor 2	103%	91%	Recept. 2	23%
Doctor 3	100%	87%	Recept. 3	15%
Doctor 4	96%	89%	Nurse 1	7%
Nurse Clin. 1	19%		Nurse 2	16%
Nurse Clin. 2	20%		Night Aide	50%
Nurse Clin. 3	- %		Aide 1	55%
Night Doctor	10%		Aide 2	39%
Night Recept.	36%		Lab. Tech.	- %
Patients		31%		

Average Waiting Room Time 41 min.

Scheduled 21 min. Call-ahead 51 min. Walk-ins 131 min.

T-Test

	Mean	Std. Dev.	T-Score
Util_{TS}	100.32%	2.59	2.04
Util_{TT}	89.26%	1.55	3.09
Patient's Time	82.25 min.	6.63	0.31
Doctor's Time*	28,748 min.	485.8	1.63

* Time in clinic during the number of months noted above.

10% RETURNS FROM NURSE (B-32)

LENGTH OF RUN 3 MONTHS

UTILIZATION	SCHEDULED TIMES	TIME THERE	UTILIZATION	SCHEDULED TIMES
DOCTOR 1	100%	86%	RECEPT. 1	- %
DOCTOR 2	101%	92%	RECEPT. 2	- %
DOCTOR 3	94%	84%	RECEPT. 3	- %
DOCTOR 4	93%	85%	NURSE 1	8%
NURSE CLIN. 1	20%		NURSE 2	17%
NURSE CLIN. 2	19%		NIGHT AIDE	50%
NURSE CLIN. 3	- %		AIDE 1	56%
NIGHT DOCTOR	- %		AIDE 2	41%
NIGHT RECEPT.	- %		LAB. TECH.	- %
PATIENTS		32%		

AVERAGE WAITING ROOM TIME 40 MIN.

SCHEDULED 21 MIN. CALL-AHEAD 58 MIN. WALK-INS 117 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	96.71 %	3.54	1.12
UTIL_{TT}	86.65 %	3.25	1.47
PATIENT'S TIME	79.95 MIN.	9.80	0.54
DOCTOR'S TIME*	28,830 MIN.	356.6	0.49

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

25% RETURNS FROM NURSE (B-33)

LENGTH OF RUN 3 MONTHS

	UTILIZATION			UTILIZATION
	SCHEDULED TIMES	TIME THERE		SCHEDULED TIMES
DOCTOR 1	101%	87%	RECEPT. 1	- %
DOCTOR 2	104%	93%	RECEPT. 2	- %
DOCTOR 3	105%	91%	RECEPT. 3	- %
DOCTOR 4	100%	89%	NURSE 1	7%
NURSE CLIN. 1	21%		NURSE 2	18%
NURSE CLIN. 2	18%		NIGHT AIDE	55%
NURSE CLIN. 3	- %		AIDE 1	56%
NIGHT DOCTOR	- %		AIDE 2	41%
NIGHT RECEPT.	- %		LAB. TECH.	- %
PATIENTS		32%		

AVERAGE WAITING ROOM TIME 41 MIN.

SCHEDULED 22 MIN. CALL-AHEAD 63 MIN. WALK-INS 124 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	102.36%	2.39	5.07
UTIL_{TT}	89.89%	2.39	4.27
PATIENT'S TIME	83.25 MIN.	5.31	1.18
DOCTOR'S TIME*	29,415 MIN.	303.4	1.86

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

5% LAB RETURN RATE (B-34)

Length of run 3 months

	UTILIZATION			UTILIZATION
	Scheduled Times	Time There		Scheduled Times
Doctor 1	96%	84%	Recept. 1	- %
Doctor 2	93%	85%	Recept. 2	- %
Doctor 3	96%	84%	Recept. 3	- %
Doctor 4	93%	85%	Nurse 1	7%
Nurse Clin. 1	20%		Nurse 2	17%
Nurse Clin. 2	17%		Night Aide	47%
Nurse Clin. 3	- %		Aide 1	55%
Night Doctor	- %		Aide 2	41%
Night Recept.	- %		Lab. Tech.	- %
Patients		34%		

Average Waiting Room Time 34 min.

Scheduled - min. Call-ahead - min. Walk-ins - min.

t-Test

	Mean	Std. Dev.	t-Score
Util_{TS}	94.62 %	1.68	0.14
Util_{TT}	84.63 %	0.35	0.05
Patient's Time	73.40 min.	6.26	0.57
Doctor's Time*	28,875 min.	337.8	0.32

* Time in clinic during the number of months noted above.

25% LAB RETURN RATE (B-35)

Length of run 3 months

UTILIZATION	Scheduled Times	Time There
Doctor 1	98%	87%
Doctor 2	98%	89%
Doctor 3	97%	85%
Doctor 4	93%	82%
Nurse Clin. 1	19%	
Nurse Clin. 2	17%	
Nurse Clin. 3	- %	
Night Doctor	- %	
Night Recept.	- %	
Patients		33%

UTILIZATION	Scheduled Times
Recept. 1	- %
Recept. 2	- %
Recept. 3	- %
Nurse 1	8%
Nurse 2	17%
Night Aide	52%
Aide 1	56%
Aide 2	41%
Lab. Tech.	- %

Average Waiting Room Time 36 min.

Scheduled - min. Call-ahead - min. Walk-ins - min.

T-Test

	Mean	Std. Dev.	T-Score
Util$_{TS}$	96.55 %	2.06	1.21
Util$_{TT}$	85.83 %	2.52	0.99
Patient's Time	75.14 min.	9.53	0.25
Doctor's Time*	29,063 min.	340.3	0.42

* Time in clinic during the number of months noted above.

APPENDIX C 320 FAMILIES, 2 NUR. CLIN., 1 EXAM ROOM (C-1)

Length of run 12 months

UTILIZATION

	Scheduled Times	Time There
Doctor 1	97%	87%
Doctor 2	94%	85%
Doctor 3	91%	79%
Doctor 4	97%	87%
Nurse Clin. 1	19%	
Nurse Clin. 2	17%	
Nurse Clin. 3	- %	
Night Doctor	10%	
Night Recept.	35%	
Patients		33%

UTILIZATION

	Scheduled Times
Recept. 1	40%
Recept. 2	23%
Recept. 3	15%
Nurse 1	7%
Nurse 2	17%
Night Aide	49%
Aide 1	55%
Aide 2	40%
Lab. Tech.	13%

Average Waiting Room Time 37 min.

Scheduled 20 min. Call-ahead 52 min. Walk-ins 111 min.

T-Test

	Mean	Std. Dev.	T-Score
Util$_{TS}$	94.96 %	-	-
Util$_{TT}$	84.49 %	-	-
Patient's Time	76.53 min.	-	-
Doctor's Time*	116,165 min.	-	-

* Time in clinic during the number of months noted above.

425 FAMILIES, 2 NUR. CLIN., 2 EXAM ROOMS (C-2)

Length of run 12 months

UTILIZATION	Scheduled Times	Time There
Doctor 1	102%	91%
Doctor 2	96%	86%
Doctor 3	96%	84%
Doctor 4	98%	87%
Nurse Clin. 1	73%	
Nurse Clin. 2	73%	
Nurse Clin. 3	- %	
Night Doctor	14%	
Night Recept.	47%	
Patients		28%

UTILIZATION	Scheduled Times
Recept. 1	48%
Recept. 2	32%
Recept. 3	22%
Nurse 1	12%
Nurse 2	25%
Night Aide	70%
Aide 1	64%
Aide 2	53%
Lab. Tech.	16%

Average Waiting Room Time 46 min.

Scheduled 24 min. Call-ahead 78 min. Walk-ins 132 min.

T-Test

	Mean	Std. Dev.	T-Score
Util_{TS}	98.05 %	-	-
Util_{TT}	86.71 %	-	-
Patient's Time	88.87 min.	-	-
Doctor's Time*	116,850 min.	-	-

* Time in clinic during the number of months noted above.

500 FAMILIES, 3 NUR. CLIN., 2 EXAM ROOMS (C-3)

LENGTH OF RUN 12 MONTHS

UTILIZATION

	SCHEDULED TIMES	TIME THERE
DOCTOR 1	104%	88%
DOCTOR 2	101%	90%
DOCTOR 3	107%	91%
DOCTOR 4	100%	89%
NURSE CLIN. 1	70%	
NURSE CLIN. 2	68%	
NURSE CLIN. 3	74%	
NIGHT DOCTOR	15%	
NIGHT RECEPT.	54%	
PATIENTS		24%

UTILIZATION

	SCHEDULED TIMES
RECEPT. 1	51%
RECEPT. 2	36%
RECEPT. 3	26%
NURSE 1	15%
NURSE 2	26%
NIGHT AIDE	89%
AIDE 1	68%
AIDE 2	60%
LAB. TECH.	17%

AVERAGE WAITING ROOM TIME 57 MIN.

SCHEDULED 28 MIN. CALL-AHEAD 103 MIN. WALK-INS 170 MIN.

T-TEST

	MEAN	STD. DEV.	T-SCORE
UTIL_{TS}	103.07%	-	-
UTIL_{TT}	89.40%	-	-
PATIENT'S TIME	109.80 MIN.	-	-
DOCTOR'S TIME*	119,100 MIN.	-	-

* TIME IN CLINIC DURING THE NUMBER OF MONTHS NOTED ABOVE.

PROGRAM 1

```
// EXEC GPSS,PARM=C,REGION=250K
//GO.DOUTPUT  DD  SYSOUT=A,SPACE=(CYL,(5,1))
//GO.SYSIN  DD *
       REALLOCATE COM,84000
       REALLOCATE BLO,840,FUN,125,VAR,80
       REALLOCATE FAC,36,STO,31,LOG,70,FSV,45
       REALLOCATE HSV,0,CHA,0,GRP,0,BVR,0,FMS,0,HMS,0
       REALLOCATE QUE,27,TAB,16,XAC,900
       SIMULATE
*
       RMULT      987,789,963,741,753,951,759,957
*
*
*
*        THIS IS A MODEL OF A FAMILY PRACTICE CLINIC
*              J.M. LARKINS AND D. DILLEY
*
*
       INITIAL    LS1/LS2/LS3/LS4/LS5/LS6/LS7/LS8/LS9/LS10
       INITIAL    LS21/LS22/LS23/LS24/LS25/LS26/LS27/LS28
       INITIAL    LS29/LS30/LS31/LS32/LS33/LS34/LS36/LS37
       INITIAL    LS38/LS39/LS40/LS41/LS42/LS43/LS44
       INITIAL    LS45/LS46/LS47/LS48/LS49/LS50/LS51/LS52
       INITIAL    LS53/LS54/LS55/LS56/LS57/LS58/LS59/LS60
       INITIAL    X1-X10,30
       INITIAL    X11,10/X12,2/X13,3/X14,4/X15,1/X16,2/X17,3
       INITIAL    X18,6/X19,7/X20,10/X21,7
*
*
*      FACILITIES     1-5      DOCTORS
*      FACILITIES     6-10     NURSE CLINICIANS
*      FACILITIES    21-24     RECEPTIONISTS
*      FACILITY      25        NIGHT RECEPTIONIST
*      FACILITIES    26-29     DAY BACK OFFICE GIRLS
*      FACILITY      30        NIGHT BACK OFFICE GIRL
*      FACILITIES    31-34     NURSES
*      FACILITY      35        AFTER HOURS DOCTOR
*      FACILITY      36        LAB TECH
*
*
     1 STORAGE    2                      EXAM ROOMS FOR DOC 1
     2 STORAGE    2                      EXAM ROOMS FOR DOC 2
     3 STORAGE    2                      EXAM ROOMS FOR DOC 3
     4 STORAGE    2                      EXAM ROOMS FOR DOC 4
     5 STORAGE    2                      EXAM ROOMS FOR DOC 5
     6 STORAGE    1                      EXAM ROOM NUR CLIN 1
     7 STORAGE    1                      EXAM ROOM NUR CLIN 2
     8 STORAGE    1                      EXAM ROOM NUR CLIN 3
     9 STORAGE    1                      EXAM ROOM NUR CLIN 4
    10 STORAGE    1                      EXAM ROOM NUR CLIN 5
    11 STORAGE    10           S
    12 STORAGE    10            C
    13 STORAGE    10             H
    14 STORAGE    10              E
    15 STORAGE    10               D
    16 STORAGE    10                U
    17 STORAGE    10                 L
    18 STORAGE    10                  I
    19 STORAGE    10                   N
    20 STORAGE    10                    G
    21 STORAGE    2
    22 STORAGE    2
    23 STORAGE    2                         S
    24 STORAGE    2                          T
    25 STORAGE    2                           O
    26 STORAGE    2                            R
    27 STORAGE    2                             A
    28 STORAGE    2                              G
    29 STORAGE    2                               E
    30 STORAGE    2                                S
    31 STORAGE    10           LAB IN CLINIC
*
```

```
 1 TABLE        V60,720,15,50               DOC 1 QUITTING TIME
 2 TABLE        V60,720,15,50               DOC 2 QUITTING TIME
 3 TABLE        V60,720,15,50               DOC 3 QUITTING TIME
 4 TABLE        V60,720,15,50               DOC 4 QUITTING TIME
10 TABLE        V60,750,15,35               DUMP TABLE
11 QTABLE       11,0,720,100                TIME GENERATE TO OFF
12 QTABLE       12,0,10,100                 SCHED PAT WAITING
13 QTABLE       13,0,5,50                   OVERALL WAITING ROOM
14 QTABLE       14,0,10,40                  TODAY PAT WAITING RM
15 QTABLE       15,0,60,70                  WALK-IN GEN TO OFF.
16 QTABLE       16,0,10,30                  WALK-IN WAIT ROOM
*
 1 VARIABLE     P4+10
 2 VARIABLE     P6+101
 3 VARIABLE     P6+110
 4 VARIABLE     P1+9
 5 VARIABLE     P4+40
 6 VARIABLE     P4+20
 7 VARIABLE     P4+50
 8 VARIABLE     X19+50
 9 VARIABLE     ((P4+2)@4)+1
10 VARIABLE     (X15@4)+1
11 VARIABLE     (X12@4)+1
12 VARIABLE     (X13@4)+1
13 VARIABLE     ((((1+X12-X13)/2)+2)@4)+2
14 VARIABLE     ((X16+1)@4)+1
15 VARIABLE     ((X17+1)@4)+1
16 VARIABLE     ((X21+1)@2)+6
17 VARIABLE     X22@4
18 VARIABLE     X20+50
19 VARIABLE     X21+50
20 VARIABLE     30*P3
21 VARIABLE     X11+10
22 VARIABLE     X12+10
23 VARIABLE     X13+10
24 VARIABLE     X14+10
25 VARIABLE     X15+10
26 VARIABLE     X16+10
27 VARIABLE     X17+10
28 VARIABLE     X18+10
29 VARIABLE     X19+10
30 VARIABLE     X20+10
31 VARIABLE     X21+10
32 VARIABLE     X11+40
33 VARIABLE     X12+40
34 VARIABLE     X13+40
35 VARIABLE     X14+40
36 VARIABLE     X15+40
37 VARIABLE     X16+40
38 VARIABLE     X17+40
39 VARIABLE     X18+40
40 VARIABLE     X19+40
41 VARIABLE     X20+40
42 VARIABLE     X21+40
43 VARIABLE     X11+50
44 VARIABLE     X12+50
45 VARIABLE     X13+50
46 VARIABLE     X14+50
47 VARIABLE     X15+50
48 VARIABLE     X16+50
49 VARIABLE     X17+50
50 VARIABLE     X18+50
51 VARIABLE     P5+10
52 VARIABLE     P4+60
53 VARIABLE     X11+60
54 VARIABLE     X12+60
55 VARIABLE     X13+60
56 VARIABLE     X14+60
57 VARIABLE     X15+60
58 VARIABLE     X16+60
59 VARIABLE     X17+60
60 VARIABLE     C1@1440
```

```
     61 VARIABLE     (FR1*473)/1000
     62 VARIABLE     (FR2*464)/1000
     63 VARIABLE     (FR3*473)/1000
     64 VARIABLE     (FR4*464)/1000
     65 VARIABLE     (FR21*395)/1000
     66 VARIABLE     (FR22*395)/1000
     67 VARIABLE     (FR23*395)/1000
     68 VARIABLE     (FR24*395)/1000
     69 VARIABLE     (FR25*611)/1000
     70 VARIABLE     (FR26*373)/1000
     71 VARIABLE     (FR27*373)/1000
     72 VARIABLE     (FR30*747)/1000
     73 VARIABLE     (FR31*373)/1000
     74 VARIABLE     (FR32*373)/1000
     75 VARIABLE     (FR35*167)/1000
     76 VARIABLE     (FR36*373)/1000
     77 VARIABLE     (FR6*378)/1000
     78 VARIABLE     (FR7*378)/1000
     79 VARIABLE     (FR8*473)/1000
*
*        THESE FUNCTIONS ASSIGN THE REFERRAL RATE
*
      1 FUNCTION     RN2,D2
.85,0/1,1
      2 FUNCTION     RN2,D2
.75,0/1,1
      3 FUNCTION     RN2,D2
.95,0/1,1
      4 FUNCTION     RN2,D2
.85,0/1,1
      5 FUNCTION     RN2,D2
.85,0/1,1
      6 FUNCTION     RN2,D2
.85,0/1,1
      7 FUNCTION     RN2,D2
.80,0/1,1
      8 FUNCTION     RN2,D2
.90,0/1,1
      9 FUNCTION     RN2,D2
.85,0/1,1
*
*        THE FOLLOWING FUNCTIONS ASSIGN A DOCTOR
*             OR NURSE CLINICIAN NUMBER
*
     10 FUNCTION     RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
     11 FUNCTION     RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
     12 FUNCTION     RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
     13 FUNCTION     RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
     14 FUNCTION     RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
     15 FUNCTION     RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
     16 FUNCTION     RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
     17 FUNCTION     RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
     18 FUNCTION     RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
     19 FUNCTION     RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
     20 FUNCTION     RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
     21 FUNCTION     RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
     22 FUNCTION     RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
     23 FUNCTION     RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
```

```
   24 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
   25 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
   26 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
   27 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
   28 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
   29 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   30 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   31 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   32 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   33 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
   34 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
   35 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
   36 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
   37 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
   38 FUNCTION    RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
   39 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   40 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
   41 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
   42 FUNCTION    RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
   43 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   44 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
   45 FUNCTION    RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
   46 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   47 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   48 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   49 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
   50 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   51 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   52 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   53 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
   54 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   55 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   56 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   57 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   58 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
   59 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
```

```
    60 FUNCTION    RN3,D6
.2375,1/.4750,2/.7125,3/.95,4/.975,6/1,7
    61 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    62 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    63 FUNCTION    RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
    64 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    65 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    66 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    67 FUNCTION    RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
    68 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
    69 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
    70 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
    71 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
    72 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
    73 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
    74 FUNCTION    RN3,D6
.2375,1/.4750,2/.7175,3/.95,4/.975,6/1,7
    75 FUNCTION    RN3,D6
.2375,1/.4750,2/.7175,3/.95,4/.975,6/1,7
    76 FUNCTION    RN3,D6
.2375,1/.4750,2/.7175,3/.95,4/.975,6/1,7
    77 FUNCTION    RN3,D6
.2375,1/.4750,2/.7175,3/.95,4/.975,6/1,7
    78 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    79 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    80 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    81 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    82 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    83 FUNCTION    RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
    84 FUNCTION    RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
    85 FUNCTION    RN3,D6
.2375,1/.4750,2/.7175,3/.95,4/.975,6/1,7
    86 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    87 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    88 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    89 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    90 FUNCTION    RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
    91 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    92 FUNCTION    RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
    93 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    94 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
    95 FUNCTION    RN3,D6
.20,1/.40,2/.60,3/.80,4/.90,6/1,7
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     96 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
     97 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
     98 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
     99 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
    100 FUNCTION    RN3,D6
.2125,1/.425,2/.6375,3/.85,4/.925,6/1,7
    101 FUNCTION    RN3,D6
.225,1/.45,2/.675,3/.90,4/.95,6/1,7
*
*       THESE FUNCTIONS ASSIGN A SEVERITY CODE
*
    102 FUNCTION    RN4,D3
.030,1/.15,2/1,3
    103 FUNCTION    RN4,D3
.040,1/.24,2/1,3
    104 FUNCTION    RN4,D3
.020,1/.12,2/1,3
    105 FUNCTION    RN4,D3
.020,1/.17,2/1,3
    106 FUNCTION    RN4,D3
.020,1/.10,2/1,3
    107 FUNCTION    RN4,D3
.030,1/.15,2/1,3
    108 FUNCTION    RN4,D3
.005,1/.05,2/1,3
    109 FUNCTION    RN4,D3
.050,1/.15,2/1,3
    110 FUNCTION    RN4,D3
.020,1/.20,2/1,3
*
*       THE APPOINTMENT SIZE IS ASSIGNED BY THE FOLLOWING
*
    111 FUNCTION    RN5,D4
.90,1/.95,2/.980,4/1,6
    112 FUNCTION    RN5,D4
.90,1/.95,2/.980,4/1,6
    113 FUNCTION    RN5,D4
.90,1/.95,2/.980,4/1,6
    114 FUNCTION    RN5,D4
.90,1/.95,2/.980,4/1,6
    115 FUNCTION    RN5,D4
.80,1/.90,2/.970,4/1,6
    116 FUNCTION    RN5,D4
.90,1/.95,2/.980,4/1,6
    117 FUNCTION    RN5,D4
.95,1/.98,2/.990,4/1,6
    118 FUNCTION    RN5,D4
.80,1/.90,2/.970,4/1,6
    119 FUNCTION    RN5,D4
.80,1/.90,2/.970,4/1,6
*
*
 EXPC   FUNCTION    RN7,C24
0,0/.1,.104/.2,.222/.3,.335/.4,.509/.5,.69/.6,.915/.7,1.2/.7
.8,1.6/.84,1.83/.88,2.12/.9,2.3/.92,2.52/.94,2.81/.95,2.99/.
.97,3.5/.98,3.9/.99,4.6/.995,5.3/.998,6.2/.999,7/.9998,8
*
*
 ARIVE FUNCTION     RN6,C7
0,0/.05,.333/.20,.667/.50,1/.80,1.333/.95,1.667/1,2
*
*
 LONG   FUNCTION    P3,D4
1,0/2,1/4,3/6,5
*
*
 DOTC   FUNCTION    RN7,D4
.25,1/.50,2/.75,3/1,4
```

```
*       ASSIGNS NUR CLIN TO DAY OR NIGHT DUTY
*
 NDAY   STARTMACRO
        TEST E       V17,K3,#A
        SAVEVALUE    18,K10
        SAVEVALUE    20,K6
 #A     TEST E       V17,K0,#B
        SAVEVALUE    18,K6
        SAVEVALUE    20,K10
 #B     TEST E       V17,K1,#C
        SAVEVALUE    19,K10
        SAVEVALUE    20,K7
 #C     TEST E       V17,K2,#D
        SAVEVALUE    19,K7
        SAVEVALUE    20,K10
 #D     SAVEVALUE    15,V10
        SAVEVALUE    12,V11
        SAVEVALUE    13,V12
        ENDMACRO
*
*       OPENS AND CLOSES SCHEDULE GATES
*
 LOGSW  STARTMACRO
        LOGIC S      #A
        LOGIC S      #B
        LOGIC S      #C
        LOGIC S      #D
        LOGIC S      #E
        LOGIC R      #F
        LOGIC R      #G
        LOGIC R      #H
        LOGIC R      #I
        LOGIC R      #J
        ENDMACRO
*
*       RESET FIRST APPOINTMENT SIZE TO 1 PERIOD
*
 INIT   STARTMACRO
        SAVEVALUE    1,30
        SAVEVALUE    2,30
        SAVEVALUE    3,30
        SAVEVALUE    4,30
        SAVEVALUE    5,30
        SAVEVALUE    6,30
        SAVEVALUE    7,30
        SAVEVALUE    8,30
        SAVEVALUE    9,30
        SAVEVALUE    10,30
        ENDMACRO
*
*
*          THESE GENERATE PATIENT VISITS
*          THIS RUN FOR 320 FAMILIES
*
*
*       MALES
*
 SAD1   GENERATE     2216,FN$EXPO,,,8,6     GP MALE 0-4
        ASSIGN       1,1
        TRANSFER     ,AGN1
 SAD2   GENERATE     1758,FN$EXPO,,,8,6     GP MALE 5-14
        ASSIGN       1,2
        TRANSFER     ,AGN1
 SAD3   GENERATE     1146,FN$EXPO,,,8,6     GP MALE 15-29
        ASSIGN       1,3
        TRANSFER     ,AGN1
 SAD4   GENERATE     1352,FN$EXPO,,,8,6     GP MALE 30-54
        ASSIGN       1,4
        TRANSFER     ,AGN1
 SAD5   GENERATE     10528,FN$EXPO,,,8,6    GP MALE 55-79
        ASSIGN       1,5
        TRANSFER     ,AGN1
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SAD6   GENERATE   55619,FN$EXPO,,,8,6   GP MALE 80+
       ASSIGN     1,6
       TRANSFER   ,AGN1
SAD7   GENERATE   1764,FN$EXPO,,,8,6    SURG MALE 0-14
       ASSIGN     1,7
       TRANSFER   ,AGN2
SAD8   GENERATE   948,FN$EXPO,,,8,6     SURG MALE 15-39
       ASSIGN     1,8
       TRANSFER   ,AGN2
SAD9   GENERATE   4137,FN$EXPO,,,8,6    SURG MALE 40-59
       ASSIGN     1,9
       TRANSFER   ,AGN2
SAD10  GENERATE   11869,FN$EXPO,,,8,6   SURG MALE 60-74
       ASSIGN     1,10
       TRANSFER   ,AGN2
SAD11  GENERATE   79878,FN$EXPO,,,8,6   SURG MALE 75+
       ASSIGN     1,11
       TRANSFER   ,AGN2
*
SAD12  GENERATE   1415,FN$EXPO,,,8,6    ALL/SHOTS MALE 0-4
       ASSIGN     1,12
       TRANSFER   ,AGN3
SAD13  GENERATE   593,FN$EXPO,,,8,6     ALL/SHOTS MALE 5-14
       ASSIGN     1,13
       TRANSFER   ,AGN3
SAD14  GENERATE   3821,FN$EXPO,,,8,6    ALL/SHOTS MALE 15-19
       ASSIGN     1,14
       TRANSFER   ,AGN3
SAD15  GENERATE   1555,FN$EXPO,,,8,6    ALL/SHOTS MALE 20-29
       ASSIGN     1,15
       TRANSFER   ,AGN3
SAD16  GENERATE   696,FN$EXPO,,,8,6     ALL/SHOTS MALE 30-59
       ASSIGN     1,16
       TRANSFER   ,AGN3
SAD17  GENERATE   23287,FN$EXPO,,,8,6   ALL/SHOTS MALE 60-69
       ASSIGN     1,17
       TRANSFER   ,AGN3
SAD18  GENERATE   26201,FN$EXPO,,,8,6   ALL/SHOTS MALE 70-74
       ASSIGN     1,18
       TRANSFER   ,AGN3
SAD19  GENERATE   73613,FN$EXPO,,,8,6   ALL/SHOTS MALE75+
       ASSIGN     1,19
       TRANSFER   ,AGN3
*
SAD20  GENERATE   805,FN$EXPO,,,8,6     EENT MALE 0-44
       ASSIGN     1,20
       TRANSFER   ,AGN4
SAD21  GENERATE   7184,FN$EXPO,,,8,6    EENT MALE 45-64
       ASSIGN     1,21
       TRANSFER   ,AGN4
SAD22  GENERATE   9125,FN$EXPO,,,8,6    EENT MALE 65+
       ASSIGN     1,22
       TRANSFER   ,AGN4
*
SAD23  GENERATE   7500,FN$EXPO,,,8,6    INT MED MALE 0-14
       ASSIGN     1,23
       TRANSFER   ,AGN5
SAD24  GENERATE   5210,FN$EXPO,,,8,6    INT MED MALE 15-19
       ASSIGN     1,24
       TRANSFER   ,AGN5
SAD25  GENERATE   416,FN$EXPO,,,8,6     INT MED MALE 20-44
       ASSIGN     1,25
       TRANSFER   ,AGN5
SAD26  GENERATE   5625,FN$EXPO,,,8,6    INT MED MALE 45-49
       ASSIGN     1,26
       TRANSFER   ,AGN5
SAD27  GENERATE   6266,FN$EXPO,,,8,6    INT MED MALE 50-59
       ASSIGN     1,27
       TRANSFER   ,AGN5
SAD28  GENERATE   3924,FN$EXPO,,,8,6    INT MED MALE 60-74
       ASSIGN     1,28
       TRANSFER   ,AGN5
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 SAD29 GENERATE     12945,FN$EXPO,,,8,6     INT MED MALE 75+
       ASSIGN       1,29
       TRANSFER     ,AGN5
 SAD30 GENERATE     2496,FN$EXPO,,,8,6      OTHERS MALE 0-29
       ASSIGN       1,30
       TRANSFER     ,AGN6
 SAD31 GENERATE     1718,FN$EXPO,,,8,6      OTHERS MALE 30-49
       ASSIGN       1,31
       TRANSFER     ,AGN6
 SAD32 GENERATE     24154,FN$EXPO,,,8,6     OTHERS MALE 50-59
       ASSIGN       1,32
       TRANSFER     ,AGN6
 SAD33 GENERATE     6780,FN$EXPO,,,8,6      OTHERS MALE 60+
       ASSIGN       1,33
       TRANSFER     ,AGN6
*
 SAD34 GENERATE     8571,FN$EXPO,,,8,6      DERM MALE 0-14
       ASSIGN       1,34
       TRANSFER     ,AGN7
 SAD35 GENERATE     1721,FN$EXPO,,,8,6      DERM AMLE 15-79
       ASSIGN       1,35
       TRANSFER     ,AGN7
 SAD36 GENERATE     134081,FN$EXPO,,,8,6    DERM MALE 80+
       ASSIGN       1,36
       TRANSFER     ,AGN7
*
 SAD37 GENERATE     316,FN$EXPO,,,8,6       PED MALE 0-4
       ASSIGN       1,37
       TRANSFER     ,AGN9
 SAD38 GENERATE     775,FN$EXPO,,,8,6       PED MALE 5-9
       ASSIGN       1,38
       TRANSFER     ,AGN9
 SAD39 GENERATE     1859,FN$EXPO,,,8,6      PED MALE 10-14
       ASSIGN       1,39
       TRANSFER     ,AGN9
 SAD40 GENERATE     30863,FN$EXPO,,,8,6     PED MALE 15-19
       ASSIGN       1,40
       TRANSFER     ,AGN9
*
*
*      FEMALES UNDER 15
*
 SAD41 GENERATE     2673,FN$EXPO,,,8,6      GP FEMALE 0-4
       ASSIGN       1,41
       TRANSFER     ,AGN1
 SAD42 GENERATE     2305,FN$EXPO,,,8,6      GP FEMALE 5-14
       ASSIGN       1,42
       TRANSFER     ,AGN1
*
 SAD43 GENERATE     2401,FN$EXPO,,,8,6      SURG FEMALE 0-14
       ASSIGN       1,43
       TRANSFER     ,AGN2
*
 SAD44 GENERATE     548,FN$EXPO,,,8,6       ALL/SHOTS FEM 0-14
       ASSIGN       1,44
       TRANSFER     ,AGN3
*
 SAD45 GENERATE     11230,FN$EXPO,,,8,6     EENT FEMALE 0-4
       ASSIGN       1,45
       TRANSFER     ,AGN4
*
 SAD46 GENERATE     7203,FN$EXPO,,,8,6      INT MED FEMALE 0-14
       ASSIGN       1,46
       TRANSFER     ,AGN5
*
 SAD47 GENERATE     5763,FN$EXPO,,,8,6      DERM FEMALE 0-14
       ASSIGN       1,47
       TRANSFER     ,AGN7
*
 SAD48 GENERATE     28815,FN$EXPO,,,8,6     OB/GYN FEMALE 0-14
       ASSIGN       1,48
       TRANSFER     ,AGN8
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*
*
 SAD49 GENERATE      344,FN$EXPO,,,8,6        PED FEMALE 0-4
       ASSIGN        1,49
       TRANSFER      ,AGN9
 SAD50 GENERATE      842,FN$EXPO,,,8,6        PED FEMALE 5-9
       ASSIGN        1,50
       TRANSFER      ,AGN9
 SAD51 GENERATE      1511,FN$EXPO,,,8,6       PED FEMALE 10-14
       ASSIGN        1,51
       TRANSFER      ,AGN9
*
*      ADULT FEMALES
*
 SAD52 GENERATE      1044,FN$EXPO,,,8,6       GP FEMALE 15-29
       ASSIGN        1,52
       TRANSFER      ,AGN1
 SAD53 GENERATE      1410,FN$EXPO,,,8,6       GP FEMALE 30-74
       ASSIGN        1,53
       TRANSFER      ,AGN1
 SAD54 GENERATE      37542,FN$EXPO,,,8,6      GP FEMALE 75+
       ASSIGN        1,54
 AGN1  ASSIGN        6,1
       TRANSFER      ,ASGN
*
 SAD55 GENERATE      1526,FN$EXPO,,,8,6       SURG FEMALE 15-34
       ASSIGN        1,55
       TRANSFER      ,AGN2
 SAD56 GENERATE      3106,FN$EXPO,,,8,6       SURG FEMALE 35-49
       ASSIGN        1,56
       TRANSFER      ,AGN2
 SAD57 GENERATE      6563,FN$EXPO,,,8,6       SURG FEMALE 50-79
       ASSIGN        1,57
       TRANSFER      ,AGN2
 SAD58 GENERATE      103058,FN$EXPO,,,8,6     SURG FEMALE 80+
       ASSIGN        1,58
 AGN2  ASSIGN        6,2
       TRANSFER      ,ASGN
*
 SAD59 GENERATE      979,FN$EXPO,,,8,6        ALL/SHOTS FEM 15-29
       ASSIGN        1,59
       TRANSFER      ,AGN3
 SAD60 GENERATE      1307,FN$EXPO,,,8,6       ALL/SHOTS 30-34
       ASSIGN        1,60
       TRANSFER      ,AGN3
 SAD61 GENERATE      1620,FN$EXPO,,,8,6       ALL SHOTS FEM 35-49
       ASSIGN        1,61
       TRANSFER      ,AGN3
 SAD62 GENERATE      18124,FN$EXPO,,,8,6      ALL/SHOTS FEM 50-54
       ASSIGN        1,62
       TRANSFER      ,AGN3
 SAD63 GENERATE      6074,FN$EXPO,,,8,6       ALL/SHOTS FEM 55-79
       ASSIGN        1,63
       TRANSFER      ,AGN3
 SAD64 GENERATE      194666,FN$EXPO,,,8,6     ALL/SHOTS FEMALE 80+
       ASSIGN        1,64
 AGN3  ASSIGN        6,3
       TRANSFER      ,ASGN
*
 SAD65 GENERATE      858,FN$EXPO,,,8,6        EENT FEMALE 5-39
       ASSIGN        1,65
       TRANSFER      ,AGN4
 SAD66 GENERATE      6094,FN$EXPO,,,8,6       EENT FEMALE 40-54
       ASSIGN        1,66
       TRANSFER      ,AGN4
 SAD67 GENERATE      20890,FN$EXPO,,,8,6      EENT FEMALE 55-64
       ASSIGN        1,67
       TRANSFER      ,AGN4
 SAD68 GENERATE      6897,FN$EXPO,,,8,6       EENT FEMALE 65+
       ASSIGN        1,68
 AGN4  ASSIGN        6,4
       TRANSFER      ,ASGN
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*
*
 SAD69  GENERATE     2792,FN$EXPO,,,8,6       INT MED FEMALE 15-19
        ASSIGN       1,69
        TRANSFER     ,AGN5
 SAD70  GENERATE     367,FN$EXPO,,,8,6        INT MED FEMALE 20-44
        ASSIGN       1,70
        TRANSFER     ,AGN5
 SAD71  GENERATE     3037,FN$EXPO,,,8,6       INT MED FEMALE 45-59
        ASSIGN       1,71
        TRANSFER     ,AGN5
 SAD72  GENERATE     12268,FN$EXPO,,,8,6      INT MED FEMALE 60-64
        ASSIGN       1,72
        TRANSFER     ,AGN5
 SAD73  GENERATE     4424,FN$EXPO,,,8,6       INT MED FEMALE 65-74
        ASSIGN       1,73
        TRANSFER     ,AGN5
 SAD74  GENERATE     15413,FN$EXPO,,,8,6      INT MED FEMALE 75-79
        ASSIGN       1,74
        TRANSFER     ,AGN5
 SAD75  GENERATE     18572,FN$EXPO,,,8,6      INT MED 80+
        ASSIGN       1,75
 AGN5   ASSIGN       6,5
        TRANSFER     ,ASGN
*
 SAD76  GENERATE     3878,FN$EXPO,,,8,6       OTHER FEMALE 0-24
        ASSIGN       1,76
        TRANSFER     ,AGN6
 SAD77  GENERATE     2606,FN$EXPO,,,8,6       OTHER FEMALE 25-39
        ASSIGN       1,77
        TRANSFER     ,AGN6
 SAD78  GENERATE     5019,FN$EXPO,,,8,6       OTHER FEMALE 40-54
        ASSIGN       1,78
        TRANSFER     ,AGN6
 SAD79  GENERATE     16272,FN$EXPO,,,8,6      OTHER FEMALE 55-64
        ASSIGN       1,79
        TRANSFER     ,AGN6
 SAD80  GENERATE     6781,FN$EXPO,,,8,6       OTHER FEMALE 65-79
        ASSIGN       1,80
        TRANSFER     ,AGN6
 SAD81  GENERATE     72000,FN$EXPO,,,8,6      OTHER FEMALE 80+
        ASSIGN       1,81
 AGN6   ASSIGN       6,6
        TRANSFER     ,ASGN
*
 SAD82  GENERATE     1639,FN$EXPO,,,8,6       DERM FEMALE 15-74
        ASSIGN       1,82
        TRANSFER     ,AGN7
 SAD83  GENERATE     62571,FN$EXPO,,,8,6      DERM FEMALE 75+
        ASSIGN       1,83
 AGN7   ASSIGN       6,7
        TRANSFER     ,ASGN
*
 SAD84  GENERATE     3771,FN$EXPO,,,8,6       OB/GYN FEMALE 15-19
        ASSIGN       1,84
        TRANSFER     ,AGN8
 SAD85  GENERATE     430,FN$EXPO,,,8,6        OB/GYN FEMALE 20-29
        ASSIGN       1,85
        TRANSFER     ,AGN8
 SAD86  GENERATE     1307,FN$EXPO,,,8,6       OB/GYN FEMALE 30-34
        ASSIGN       1,86
        TRANSFER     ,AGN8
 SAD87  GENERATE     2329,FN$EXPO,,,8,6       OB/GYN FEMALE 35-44
        ASSIGN       1,87
        TRANSFER     ,AGN8
 SAD88  GENERATE     10459,FN$EXPO,,,8,6      OB/GYN FEMALE 45-54
        ASSIGN       1,88
        TRANSFER     ,AGN8
 SAD89  GENERATE     29167,FN$EXPO,,,8,6      OB/GYN FEMALE 55-64
        ASSIGN       1,89
        TRANSFER     ,AGN8
*
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SAC90 GENERATE    26953,FN$EXPO,,,8,6    OB/GYN FEMALE 65-79
      ASSIGN      1,90
      TRANSFER    ,AGN8
SAC91 GENERATE    750357,FN$EXPO,,,8,6   OB/GYN FEMALE 80+
      ASSIGN      1,91
AGN8  ASSIGN      6,8
      TRANSFER    ,ASGN
*
SAC92 GENERATE    22337,FN$EXPO,,,8,6    PED FEMALE 15-19
      ASSIGN      1,92
AGN9  ASSIGN      6,9
*
*
*     ASSIGN PARAMETERS
*
ASGN  ASSIGN      2,1,V2                 SEVERITY
      ASSIGN      3,1,V3                 APPOINTMENT SIZE
      ASSIGN      4,1,V4                 DOCTOR OR NUR CLIN #
      ASSIGN      6,FN*6                 REFERRAL RATE
      TEST NE     P2,K1,EMER             RE-ROUTE EMERGENCYS
CHG3  TRANSFER    .15,RESC,WALK          SEPARATE WALK-INS
*
*     THIS SECTION HANDLES THE EMERGENCIES
*
EMER  GATE LR     35,OPEN                HAVE DOCTORS GONE
      SEIZE       35                     ENGAGE AFT HRS DOC
      ADVANCE     90,FN$EXPO             EMERGENCY TIME
      RELEASE     35
TERM  TERMINATE   0
*
OPEN  PRIORITY    10                     EMERGENCY PRIORITY
      TEST G      P4,K5,ATE              IF A NUR. CLIN.
      ASSIGN      4,V9                   ASSIGN A DOCTOR
ATE   GATE LS     P4,PREE                IS HIS DOCTOR THERE
ASIN  ASSIGN      4,V9                   ASSIGN ANOTHER DOC
      GATE LS     P4,PREE                IS THAT DOC IN
      ASSIGN      4,V9
      GATE LS     P4,PREE
      ASSIGN      4,V9
      GATE LS     P4,PREE
      ASSIGN      4,35
PREE  PREEMPT     P4                     ENGAGE DOCTOR
      ADVANCE     40,FN$EXPO             DOCTOR TIME
      RETURN      P4
      TERMINATE   0                      PATIENT EXITS SYSTEM
*
*     THE PATIENTS CALL THE OFFICE
*
RESC  QUEUE       11                     CHECK TIME TO OFFICE
RETN  GATE LR     39                     PHONES OPEN UP
      GATE LR     21,RECP                IS DAY CREW ON
      TRANSFER    ALL,BLOK1,BLOK4,4      TRY 4 TELE LINES
RECP  PREEMPT     25                     ENGAGE NITE RECEPT.
      ADVANCE     3,1                    LENGHT OF CALL
      RETURN      25
      TRANSFER    ,HANG2
BLOK1 PREEMPT     21                     PHONE RINGS LINE 1
      ADVANCE     3,1                    LENGHT OF CALL
      RETURN      21
      TRANSFER    ,HANG1
BLOK2 PREEMPT     22                     PHONE RINGS LINE 2
      ADVANCE     3,1                    LENGHT OF CALL
      RETURN      22
      TRANSFER    ,HANG1
BLOK4 PREEMPT     24                     PHONE RINGS LINE 4
      ADVANCE     3,1                    LENGHT OF CALL
      RETURN      24
HANG1 TRANSFER    .9,FWRD,APPT           FORWARD SOME TO NUR.
FWRD  PREEMPT     31                     NURSE'S PHONE RINGS
      ADVANCE     3,2                    NURSE TALKS
      RETURN      31
HANG2 TRANSFER    .9,ADOC,APPT           FORWARD SOME TO DOC
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 ADOC   GATE LR     P4,APPT                          IS DOCTOR THERE
 PDOC   PREEMPT     P4                               DOCTOR'S PHONE RINGS
        ADVANCE     3,2                              DOCTOR TALKS
        RETURN      P4
*
*       APPOINTMENT SECTION
*       SCHEDULES 2 PATIENTS EVERY 30 MINUTES
*
 APPT   TEST NE     P2,K3,GATT                       CHECK SEVERITY
        GATE LR     V1,TSEV                          TODAY IF SCHED FULL
 GATT   GATE LR     V1                               IS SCHEDULE FULL
        ENTER       V1,P3                            ENTER SCHED BOOK
        ASSIGN      5,6                              SCHEDULED CODE
        GATE SF     V1,LIT                           IS SCHED FULL
        LOGIC S     V1                               CLOSE SCHED BOOK
 LIT    GATE LR     V5                               WAIT TIL DOC ARRIVES
        LEAVE       V1,P3                            LEAVE SCHED BOOK
 DELAY  ENTER       V6                               PROVIDES SEPARATION
        ADVANCE     X*4,0                            PREV PAT APPT TIME
        SAVEVALUE   P4,V20                           PATIENT'S APPT TIME
        LEAVE       V6                               SEPARATED
        ADVANCE     30,FN$ARIVE                      ARRIVAL TIME
        TEST E      P5,K6,CONT                       SCHED OR TODAY PAT.
        TRANSFER    .05,CONT,RETN                    NO-SHOWS
*
 TSEV   ASSIGN      5,4                              MUST COME IN TODAY
        GATE LR     V7                               TODAY GATE OPEN?
        TRANSFER    ,DELAY                           NORMAL ARRIVE DIST.
*
*       WALK-INS ARE DELAYED TO DAYLIGHT
*
 WALK   QUEUE       15                               CHECK TIME TO OFFICE
        GATE LS     37,DOOR                          IS IT 8PM TO 4AM
        ADVANCE     720,0                            ADVANCE TO DAYLIGHT
 DOOR   GATE LR     38                               IS DOOR OPEN
        DEPART      15
        ASSIGN      5,2                              ASSIGN FUTURE PRIOR.
        TRANSFER    ,QUEUE
*
*       PATIENTS ARRIVE AT OFFICE
*
 CONT   GATE LR     38                               ARE OFFICES OPEN
        DEPART      11
 QUEUE  QUEUE       13                               WAITING ROOM TIMES
        GATE LR     21,RCEP                          IS DAY CREW ON?
*
        TRANSFER    ALL,BLOK5,BLOK8,4                ENGAGE A RECEPT.
 RCEP   SEIZE       25                               ENGAGE NITE RECEPT.
        ADVANCE     3,2                              RECEPTIONIST'S TIME
        RELEASE     25
        TRANSFER    ,WAIT
 BLOK5  SEIZE       21                               ENGAGE FIRST RECEPT
        ADVANCE     3,2                              RECEPTIONIST'S TIME
        RELEASE     21
        TRANSFER    ,WAIT
 BLOK6  SEIZE       22                               ENGAGE SECOND RECEPT
        ADVANCE     3,2                              RECEPTIONIST'S TIME
        RELEASE     22
        TRANSFER    ,WAIT
 BLOK8  SEIZE       24                               ENGAGE LAST RECEPT
        ADVANCE     3,2                              RECEPTIONIST'S TIME
        RELEASE     24
*
 WAIT   PRIORITY    P5                               WAITING PRIORITY
        TEST E      P5,K2,ROOM                       IF NOT WALK-INS SKIP
        GATE LS     P4,ROOM                          IS HIS DOCTOR THERE
 ASSN   ASSIGN      4,V9                             ASSIGN ANOTHER DOC
        GATE LS     P4,ROOM                          IS THAT DOC THERE
        ASSIGN      4,V9
        GATE LS     P4,ROOM
        ASSIGN      4,V9
*
```

```
*
 ROOM    DEPART        13
 QUE     QUEUE         P4                            PAT'S TIME IN CLINIC
         QUEUE         V51                           WAIT TIME SCHED TYPE
         QUEUE         17                            AVG EXAM ROOM WAIT
*
*        PATIENT ENTERS EXAM ROOM
*
         ENTER         P4                            ENGAGE EXAM ROOM
         DEPART        V51
         QUEUE         V6                            WAIT TIME IN EXAM RM
         DEPART        17
         PRIORITY      6
         GATE LR       26,NBOG                       IS DAY BOG ON
         TRANSFER      ALL,BOG1,BOGN,4               TRY EACH BOG
 NBOG    SEIZE         30                            ENGAGE NIGHT BOG
         ADVANCE       5,4                           BOG TIME
         RELEASE       30
         TRANSFER      ,DOCT
 BOG1    SEIZE         26                            ENGAGE BACK BOG 1
         ADVANCE       5,4                           BOG TIME
         RELEASE       26
         TRANSFER      ,DOCT
 BOGN    SEIZE         27                            ENGAGE BACK BOG 2
         ADVANCE       5,4                           BOG TIME
         RELEASE       27
*
*        DOCTOR SEES PATIENT
*
 DOCT    SEIZE         P4                            ENGAGE DOCTOR
         DEPART        V6
 TEGE    TEST GE       P1,K41,ADV                    IS PATIENT FEMALE
         TRANSFER      .40,OLDER,FEM                 SOME NEED OBSERVER
 OLDER   TEST GE       P1,K52,ADV                    IS FEMALE AN ADULT
         TRANSFER      .50,ADV,FEM                   SOME NEED OBSERVER
 FEM     PRIORITY      8                             TO ENGAGE OBSERVER
*
*        FEMALE OBSERVER NEEDED
*
         GATE LR       26,NAID                          ARE DAY BOG THER
         TRANSFER      ALL,AID1,NURN,4               ENGAGE NUR OR BOG
 NAID    SEIZE         30                            ENGAGE NIGHT BOG
         ADVANCE       8,2                           OBSERVER TIME
         RELEASE       30
         TRANSFER      ,TRAN
 AID1    SEIZE         26                            ENGAGE BOG AS OBS.
         ADVANCE       8,2                           OBSERVER TIME
         RELEASE       26
         TRANSFER      ,TRAN
 AIDN    SEIZE         27                            ENGAGE BOG AS OBS.
         ADVANCE       8,2                           OBSERVER TIME
         RELEASE       27
         TRANSFER      ,TRAN
 NUR1    SEIZE         32                            ENGAGE NURSE AS OBS.
         ADVANCE       8,2                           OBSERVER TIME
         RELEASE       32
         TRANSFER      ,TRAN
 NURN    SEIZE         31                            ENGAGE NURSE AS OBS.
         ADVANCE       8,2                           OBSERVER TIME
         RELEASE       31
 TRAN    ADVANCE       5,2                           DOCTOR CONFER TIME
         PRIORITY      6                             RESET PRIORITY
         TRANSFER      ,NEXT
*
 ADV     ADVANCE       13,5                          DOCTOR'S TIME
*
 NEXT    ADVANCE       15,FN$LONG                    IF MORE THAN 1 PER.
         ASSIGN        3,1                           ASSIGN PAT 1 PERIOD
         TEST L        P4,K6,CLIN                    SEEN BY DOCTOR ?
*
 JUMP    TRANSFER      .05,CLIN,NURC                 NUR CLIN CONSULT?
 NURC    PRIORITY      8                             CONSULT PRIORITY
```

```
         GATE LR     6,NCLN                  IS NUR. CLIN. 1 IN?
         GATE LR     7,NCL1                  IS NUR. CLIN. 2 IN?
         TRANSFER    ALL,NCL1,NCLN,5         TRY EACH NUR. CLIN.
NCL1     PREEMPT     6                       ENGAGE NUR CLIN 1
         GATE LR     6,CLIC                  IS NUR CLIN 1 THERE
         ADVANCE     5,4                     NUR CLIN CONSULT
CLIC     RETURN      6
         TRANSFER    ,CLIN
NCLN     PREEMPT     7                       ENGAGE NUR CLIN 2
         GATE LR     7,CLAN                  IS NUR CLIN 2 THERE
         ADVANCE     5,4                     NUR CLIN CONSULT
CLAN     RETURN      7
CLIN     PRIORITY    6                       RESET PRIORITY
*
         TEST GE     P4,K5,NONC              IF SEEN BY NUR CLIN
CHG2     TRANSFER    .10,NONC,PRCB           NO CONSULT WITH DOC
PRCB     PRIORITY    7                       CONSULT PRIORITY
         ASSIGN      5,FN$DOTO               ASSIGN A DOCTOR
         GATE LS     P5,SEZE                 IS THAT DOC THERE
ANOTH    ASSIGN      5,V9                    ASSIGN ANOTHER DOC
         GATE LS     P5,SEZE                 IS THAT DOC THERE
         ASSIGN      5,V9
         GATE LS     P5,SEZE
         ASSIGN      5,V9
SEZE     SEIZE       P5                      ENGAGE DOCTOR
         ADVANCE     10,5                    DOCTOR'S TIME
         RELEASE     P5
         PRIORITY    6                       RESET PRIORITY
NONC     TEST E      P6,K1,FINE              REFERRAL ?
REFF     ADVANCE     5,2                     REFERRAL TIME
*
*        DOCTOR LEAVES ROOM
*
FINE     RELEASE     P4                      DOCTOR DEPARTS
         GATE LR     32,OVER                 ARE NURSES THERE?
         TRANSFER    .1,EXIT,NURS            SOME NEED NURSE ATTN
*
*        NURSE'S SECTION
*
NURS     TRANSFER    ALL,BLOK9,BLOKN,4       ENGAGE A NURSE
BLOK9    SEIZE       32                      ENGAGE A NURSE
         ADVANCE     10,7                    NURSE TIME
         RELEASE     32
         TRANSFER    ,OVER
BLOKN    SEIZE       31                      ENGAGE A NURSE
         ADVANCE     10,7                    NURSE TIME
         RELEASE     31
OVER     PRIORITY    7                       RETURN PRIORITY
*
CHG1     TRANSFER    .03,EXIT,DOCR           SOME RETURN TO DOC
DOCR     SEIZE       P4                      RE-ENGAGE DOCTOR
         TRANSFER    ,TEGE
EXIT     DEPART      P4                      PAT DEPARTS EXAM RM
         GATE LS     V52,LVE                 DOC'S QUITTING TIME?
         TEST L      P4,K6,LVE               DOCTOR OR NUR CLIN
         TEST E      Q*4,K0,LVE              IS DOC'S QUEUE EMPTY
         TABULATE    P4                      RECORD QUITTING TIME
*
*        DEPART EXAM ROOM
*
LVE      LEAVE       P4                      EXIT EXAM ROOM
         TRANSFER    .1,TERM,CLAB            SOME NEED LAB WORK
CLAB     GATE LR     36,TERM                 IS LAB TECH THERE?
         ENTER       31                      ENGAGE LAB
         SEIZE       36                      ENGAGE LAB TECH
         ADVANCE     10,5                    TEST DONE
         RELEASE     36
         LEAVE       31
         PRIORITY    9                       RETURN PRIORITY
         ASSIGN      5,8                     RETURNEE NUMBER
         TEST NE     Q*4,K0,TERM             HAS DOC QUIT
         TRANSFER    .1,TERM,QUE             SOME GO BACK TO DOC
```

```
*
         GENERATE    40320,0,1,,,5                  START TIMER
         ASSIGN      1,5                            RUNS 4 WEEKS
 BACKO   LOOP        1,OUTER                        WEEKS
*
*        END OF THE MONTH
*
         SAVEVALUE   25,V61                         UTILIZATION DOCTOR 1
         SAVEVALUE   26,V62                         UTILIZATION DOCTOR 2
         SAVEVALUE   27,V63                         UTILIZATION DOCTOR 3
         SAVEVALUE   28,V64                         UTILIZATION DOCTOR 4
         SAVEVALUE   29,V77                         UTIL. NUR CLIN 1
         SAVEVALUE   30,V78                         UTIL. NUR CLIN 2
         SAVEVALUE   31,V79                         UTIL. NUR CLIN 3
         SAVEVALUE   32,V65                         UTIL. RECEPTIONIST 1
         SAVEVALUE   33,V66                         UTIL. RECEPTIONIST 2
         SAVEVALUE   34,V67                         UTIL. RECEPTIONIST 3
         SAVEVALUE   35,V68                         UTIL. RECEPTIONIST 4
         SAVEVALUE   36,V69                         UTIL. NIGHT RECEPT.
         SAVEVALUE   37,V70                         UTILIZATION AIDE 1
         SAVEVALUE   38,V71                         UTILIZATION AIDE 2
         SAVEVALUE   39,V72                         UTIL. NIGHT AIDE
         SAVEVALUE   40,V73                         UTILIZATION NURSE 1
         SAVEVALUE   41,V74                         UTILIZATION NURSE 2
         SAVEVALUE   42,V75                         UTIL. NIGHT DOCTOR
         SAVEVALUE   43,V76                         UTILIZATION LAB TECH
         TERMINATE   1
*
*
 OUTER   ASSIGN      2,6                            RUNS 5 DAYS
 BACKI   LOOP        2,INTER                        DAYS
*
*        WEEKEND SECTION
*
         ADVANCE     240,0                          0400
         SAVEVALUE   11,K10                         MORNING DOCTOR
         SAVEVALUE   22+,K1                         ADD 1 DAY
         LOGIC R     37                             OPEN WALK-IN GATE
*
         ADVANCE     210,0                          0730
         LOGIC S     V26                            SCHEDULE CONTROL
         LOGIC S     V27
         LOGIC S     V31
         LOGIC R     V37
         LOGIC R     V38
         LOGIC R     V42
         LOGIC R     25                             SAT. RECEPT ARRIVES
         LOGIC R     39                             SWITCHBOARD OPENS
*
         ADVANCE     30,0                           0800
         LOGIC S     35                             CLOSE NIGHT DOCTOR
         LOGIC R     X16                            SAT. DOCTORS
         LOGIC R     X17
         LOGIC R     X21                            SAT. NUR. CLIN.
         LOGIC R     30                             SAT. BCG
         LOGIC R     38                             OFFICE OPENS DOORS
*
         ADVANCE     120,0                          1000
         LOGIC S     V37                            SCHEDULE CONTROL
         LOGIC S     V38
         LOGIC S     V42
         LOGIC R     V48
         LOGIC R     V49
         LOGIC R     V19
*
         ADVANCE     90,0                           1130
         LOGIC S     V48                            SCHEDULE CONTROL
         LOGIC S     V49
         LOGIC S     V19
         LOGIC R     V26
         LOGIC R     V27
         LOGIC R     V31
```

```
*
       ADVANCE    30,0                  1200
       LOGIC S    37                    CLOSE WALK-IN GATE
       LOGIC S    39                    SWITCHBOARD CLOSES
       LOGIC R    35                    OPEN AFT HRS DOCTOR
*
       ADVANCE    60,0                  1300
       LOGIC S    38                    CLOSE DOORS
       LOGIC S    25                    SAT. RECEP. LEAVES
       LOGIC S    X16                   DOCTORS GO HOME
       LOGIC S    X17
       LOGIC S    X21                   SAT. NUR CLIN QUITS
*
*      THESE SECTIONS TABLE QUITING TIMES FOR DOCTORS
*
       ASSIGN     3,X16                 SAT. DOCTOR 1
       TEST E     Q*3,K0,WORK6          IS DOC 1 QUEUE EMPTY
       TABULATE   X16                   RECORDS TIME
       TRANSFER   ,LOG6
WORK6  LOGIC S    V58                   OPEN QUIT TIME TABLE
LOG6   ASSIGN     3,X17                 SAT. DOCTOR 2
       TEST E     Q*3,K0,WORK7          IS DOC 2 QUEUE EMPTY
       TABULATE   X17                   RECORDS TIME
       TRANSFER   ,LOG7
WCRK7  LOGIC S    V59                   OPEN QUIT TIME TABLE
LOG7   LOGIC S    30                    SAT. BOG FINISHES
NDAY   MACRO      MAR85,MAR86,MAR87,MAR88
       SAVEVALUE  14,V13                RESETS MORNING DOC
       SAVEVALUE  16,V14                RESETS SAT. DOCTORS
       SAVEVALUE  17,V15
       SAVEVALUE  21,V16                RESETS SAT. NUR CLIN
INIT   MACRO
*
       ADVANCE    300,0                 1900
       LOGIC R    V58                   CLOSE QUITTING TABLE
       LOGIC R    V59                   CLOSE QUITTING TABLE
*
*      ADVANCES TO SUNDAY MIDNIGHT
*
       ADVANCE    1800,0                2400
       TRANSFER   ,BACK0
*
*
*      DAILY SECTION
*
*
INTER  SAVEVALUE  22+,K1                ADD 1 DAY
       ADVANCE    240,0                 0400
       LOGIC R    37                    ALLOW WALK-INS
*
       ADVANCE    210,0                 0700
       LOGIC S    V21                   SCHEDULE CONTROL
LOGSW  MACRO      V22,V23,V24,V28,V29,V33,V34,V35,V39,V40
       LOGIC R    V32
       LOGIC R    21                    RECEPTIONISTS ARRIVE
       LOGIC R    39                    OPEN PHONES
*
       ADVANCE    30,0                  0800
       LOGIC S    35                    CLOSE NIGHT DOCTOR
       LOGIC R    X12                   DAY DOCTORS
       LOGIC R    X13
       LOGIC R    X14
       LOGIC R    X11                   MORNING DOCTOR
       LOGIC R    X18                   DAY NUR. CLIN.
       LOGIC R    X19
       LOGIC R    26                    BOG STARTS WORK
       LOGIC R    27
       LOGIC R    31                    NURSES ARRIVE
       LOGIC R    32
       LOGIC R    36                    LAB TECH STARTS WORK
       LOGIC R    38                    OPEN DOORS
*
```

```
        ADVANCE    120,0                  1000
        LOGIC S    V32                    SCHEDULE CONTROL
LOGSW   MACRO      V33,V34,V35,V39,V40,V44,V45,V46,V50,V8
        LOGIC R    V43
        LOGIC R    V21
        LOGIC R    V22
        LOGIC R    V23
        LOGIC R    V24
        LOGIC R    V28
        LOGIC R    V29
*
        ADVANCE    60,0                   1100
        LOGIC S    V43                    SCHEDULE CONTROL
        LOGIC S    V44
        LOGIC S    V45
        LOGIC S    V46
        LOGIC S    V50
        LOGIC S    V8
*
        ADVANCE    90,0                   1230
        LOGIC S    X11                    MORNING DOCTOR QUITS
        ASSIGN     3,X11                  MORNING DOCTOR
        TEST E     Q*3,K0,WORK1           IS MORN DOC QUEUE 0
        TABULATE   X11                    RECORDS TIME
        TRANSFER   ,LOG1
WORK1   LOGIC S    V53                    OPEN QUIT TIME TABLE
LOG1    LOGIC S    V25                    SCHEDULE CONTROL
        LOGIC S    V30
LOGSW   MACRO      V22,V23,V24,V28,V29,V33,V34,V35,V39,V40
        LOGIC R    V36
        LOGIC R    V41
*
        ADVANCE    30,0                   1300
        LOGIC R    X15                    AFTERNOON DOC STARTS
        LOGIC R    X20                    AFTERNOON NUR. CLIN.
*
        ADVANCE    90,0                   1430
        LOGIC S    V36                    SCHEDULE CONTROL
        LOGIC S    V41
LOGSW   MACRO      V33,V34,V35,V39,V40,V44,V45,V46,V50,V8
        LOGIC R    V47
        LOGIC R    V18
        LOGIC R    V22
        LOGIC R    V23
        LOGIC R    V24
        LOGIC R    V25
        LOGIC R    V28
        LOGIC R    V29
        LOGIC R    V30
*
        ADVANCE    60,0                   1530
        LOGIC R    V53                    CLOSE QUITTING TABLE
        LOGIC S    V18                    SCHEDULE CONTROL
        LOGIC S    V47
        LOGIC R    25                     NITE RECEPT ARRIVES
        LOGIC S    21                     RECEPTIONISTS LEAVE
*
        ADVANCE    90,0                   1700
        LOGIC S    V44                    SCHEDULE CONTROL
        LOGIC S    V45
        LOGIC S    V46
        LOGIC S    V50
        LOGIC S    V8
        LOGIC R    30                     NIGHT AID ARRIVES
        LOGIC S    26                     DAY AIDS LEAVE
        LOGIC S    27
        LOGIC S    31                     NURSES LEAVE
        LOGIC S    32
        LOGIC S    36                     LAB TECH LEAVES
        LOGIC S    X12                    DAY DOCTORS GO HOME
        LOGIC S    X13
        LOGIC S    X14
```

```
        ASSIGN      3,X12                        DAY DOCTOR 1
        TEST E      Q*3,K0,WORK2                 IS DOC 1 QUEUE EMPTY
        TABULATE    X12                          RECORDS TIME
        TRANSFER    ,LOG2
 WORK2  LOGIC S     V54                          OPEN QUIT TIME TABLE
 LOG2   ASSIGN      3,X13                        DAY DOCTOR 2
        TEST E      Q*3,K0,WORK3                 IS DOC 2 QUEUE EMPTY
        TABULATE    X13                          RECORDS TIME
        TRANSFER    ,LOG3
 WORK3  LOGIC S     V55                          OPEN QUIT TIME TABLE
 LOG3   ASSIGN      3,X14                        DAY DOCTOR 3
        TEST E      Q*3,K0,WORK4                 IS DOC 3 QUEUE EMPTY
        TABULATE    X14                          RECORDS TIME
        TRANSFER    ,LOG4
 WORK4  LOGIC S     V56                          OPEN QUIT TIME TABLE
 LOG4   LOGIC S     X18                          DAY NUR. CLIN. LEAVE
        LOGIC S     X19
*
        ADVANCE     60,0                         1800
        LOGIC S     V25                          SCHEDULE CONTROL
        LOGIC S     V30
        LOGIC R     V36
        LOGIC R     V41
*
        ADVANCE     60,0                         1900
        LOGIC R     V54                          CLOSE
        LOGIC R     V55                             QUITTING TIME
        LOGIC R     V56                                       TABLES
        LOGIC R     V18                          SCHEDULE CONTROL
        LOGIC S     V36
        LOGIC S     V41
        LOGIC R     V25
        LOGIC R     V30
*
        ADVANCE     60,0                         2000
        LOGIC S     V18                          SCHEDULE CONTROL
        LOGIC S     25                           NITE RECEPT LEAVES
        LOGIC S     37                           CLOSE WALK-IN GATE
        LOGIC S     39                           CLOSE SWITCHBOARD
*
        ADVANCE     30,0                         2030
        LOGIC S     38                           CLOSE OFFICE DOOR
        LOGIC S     30                           NIGHT BCG QUITS
        LOGIC S     X15                          NIGHT DOCTOR QUITS
        ASSIGN      3,X15                        NIGHT DOCTOR
        TEST E      Q*3,K0,WORK5                 IS NITE DOC QUEUE 0
        TABULATE    X15                          RECORDS TIME
        TRANSFER    ,LOG5
 WORK5  LOGIC S     V57                          OPEN QUIT TIME TABLE
 LOG5   LOGIC S     X20                          NITE NUR CLIN QUITS
        LOGIC R     35                           DOCTOR ON CALL
*
        ADVANCE     210,0                        2400
        LOGIC R     V57                          CLOSE QUITTING TABLE
        SAVEVALUE   11,X15                       RESETS MORNING DOC
 NDAY   MACRO       MAR81,MAR82,MAR83,MAR84
        SAVEVALUE   14,K10                       RESETS DAY DOC 3
 INIT   MACRO
        TRANSFER    ,BACKI
*
*
        START       1
        RESET
        START       1
        RESET
        START       1
        END
```

PROGRAM 2

```
//   EXEC  FORTCLGP
//FORT.SYSIN  DD  *
C
      IMPLICIT INTEGER (A-B)                                            FIG00010
      DIMENSION CAT(92),NAS(2,17),INTER(92),CLIN(92),DOCT(5,92),NCAT(92)FIG00020
      DIMENSION ND(92),ND1(2,17),ND2(2,17),ND3(2,17),ND4(2,17)          FIG00030
C
C   NURSE CLINICIAN RATE FOR EACH CATAGCRY
C
      DATA CLIN/.05,.05,.1,.1,.15,.15,.05,.1,.1,.15,.15,.1,.1,.2,.2,.2,.FIG00040
     12,.2,.2,.05,.05,.05,.05,.1,.1,.1,.1,.1,.15,.05,.1,.1,.15,.05,.1,.1FIG00050
     25,.05,.05,.05,.1,.05,.05,.05,.1,.05,.05,.05,.05,.05,.05,.05,.1,.1,FIG00060
     3.15,.1,.1,.1,.15,.2,.2,.2,.2,.2,.2,.05,.05,.05,.05,.1,.1,.1,.1,.1,FIG00070
     4.15,.15,.05,.1,.1,.1,.1,.15,.1,.15,.1,.2,.2,.1,.1,.1,.1,.15,.1/   FIG00080
C
C
C   INTERARRIVAL TIME FOR ONE PATIENT IN EACH CATAGCRY
C
      DATA CAT/691578.9375,991698.125,720000.0,922105.25,821250.0,389333FIG00090
     1.4375,1545882.0,1051200.0,906206.875,640975.5625,1105120.0,441680.FIG00100
     28125,334777.125,500571.75,772941.1875,486666.6875,861639.375,44542FIG00110
     33.9375,1030588.25,1695484.0,847742.0,438000.0625,6570001.0,682597.FIG00120
     4375,457043.625,360000.1875,281069.5,211935.5,181241.375,3754286.0,FIG00130
     51142608.0,821250.0,461052.875,7508572.0,2389091.0,938571.5,98611.6FIG00140
     675,262800.00,413858.375,4043077.0,834285.6875,1383157.0,2190000.0,FIG00150
     7500571.75,3504000.0,6570001.0,5256001.0,26280000.0,107484.625,2654FIG00160
     854.5625,430819.875,700800.0,361639.375,750857.125,1383157.,876000.FIG00170
     90,682597.375,1030588.25,657000.0,307368.5625,457043.625,362482.75,FIG00180
     5510291.375,1946666.0,1420540.0,938571.5,710270.313,413858.38,50538FIG00190
     14.625,352751.6875,255145.6875,208571.4375,176969.6875,154134.875,1FIG00200
     285724.375,5256001.0,1592727.0,772941.1875,553263.125,339096.9375,7FIG00210
     320000.0,2102400.0,1251428.0,682597.375,211084.3125,307368.5625,547FIG00220
     4500.0,700800.0,991698.125,1347692.0,7508572.0,4043077.0/          FIG00230
C
C
C   READ IN THE NUMBER OF PATIENTS ASSIGNED TO EACH DOCTOR BY AGE/SEX CATAGORY
C
      DO 1 I=1,2                                                        FIG00240
      DO 2 J=1,17                                                       FIG00250
      READ (5,20) ND1(I,J),ND2(I,J),ND3(I,J),ND4(I,J)                   FIG00260
   20 FORMAT(4I5)                                                       FIG00270
      NAS(I,J)=ND1(I,J)+ND2(I,J)+ND3(I,J)+ND4(I,J)                      FIG00280
    2 CONTINUE                                                          FIG00290
    1 CONTINUE                                                          FIG00300
C
C   ADD TOTAL PATIENTS ASSIGNED BY AGE/SEX TO PRCBLEM CATAGORY
C
      CALL ADD(NCAT,NAS)                                                FIG00310
```

```
C
C
C     ADD PATIENT ASSIGNED TO EACH DOCTCR TO PROBLEM CATAGCRY
C         AND FIGURE DOCTOR LOAD
C
      CALL ADD(ND,ND1)                                                  FIG00320
C
      DC 3 I=1,92                                                       FIG00330
      IF (NCAT(I) .EQ. 0) NCAT(I)=1                                     FIG00340
      DCCT(1,I)=(FLOAT(ND(I))/NCAT(I))*(1.0-CLIN(I))                    FIG00350
    3 CCNTINUE                                                          FIG00360
C
      CALL ADD(ND,ND2)                                                  FIG00370
C
      DC 4 I=1,92                                                       FIG00380
      DOCT(2,I)=(FLOAT(ND(I))/NCAT(I))*(1.0-CLIN(I))+DOCT(1,I)          FIG00390
    4 CCNTINUE                                                          FIG00400
C
      CALL ADD(ND,ND3)                                                  FIG00410
C
      DO 5 I=1,92                                                       FIG00420
      DCCT(3,I)=(FLOAT(ND(I))/NCAT(I))*(1.0-CLIN(I))+DOCT(2,I)          FIG00430
    5 CCNTINUE                                                          FIG00440
C
      CALL ADD(ND,ND4)                                                  FIG00450
C
      DC 6 I=1,92                                                       FIG00460
      DCCT(4,I)=(FLOAT(ND(I))/NCAT(I))*(1.0-CLIN(I))+DOCT(3,I)          FIG00470
    6 CCNTINUE                                                          FIG00480
C
C     FIGURE NURSE CLINICIAN LOAD
C
      DC 19 I=1,92                                                      FIG00490
      DCCT(5,I)=((1.0-DOCT(4,I))/2.0)+DCCT(4,I)                         FIG00500
   19 CONTINUE                                                          FIG00510
C
C
C     PREPARES PUNCHED DECK OF DOCTOR/NURSE CLINICIAN ASSIGNMENT
C         FOR INSERTION INTO GPSS PROGRAM
C
      DC 14 I=10,101                                                    FIG00520
      PUNCH 78,I                                                        FIG00530
   78 FCRMAT ('    ',I3,' FUNCTION   RN3,D6')                           FIG00540
      PUNCH 79,(DOCT(J,I-9),J=1,5)                                      FIG00550
   79 FORMAT (F5.4,',1/',F5.4,',2/',F5.4,',3/',F5.4,',4/',F5.4,',6/1,7')FIG00560
   14 CCNTINUE                                                          FIG00570
C
C
```

```
C
C
C
C
C   FIGURE INTERARRIVAL TIMES FOR EACH CATAGORY
C
C
      DO 9 I=1,92                                                       FIG00580
      INTER(I)=CAT(I)/NCAT(I)                                           FIG00590
    9 CONTINUE                                                          FIG00600
C
C
C
C   PUNCHES CARDS FOR INSERTION INTO GPSS MODEL
C
      DO 10 I=1,9                                                       FIG00610
C
      IF (INTER(I) .GE. 1000) GO TO 11                                  FIG00620
      WRITE (6,30) I,INTER(I)                                           FIG00630
      PUNCH 30,I,INTER(I)                                               FIG00640
   30 FORMAT(' SAD',I1,2X,'GENERATE',3X,I3,',FN$EXPO,,,8,6')            FIG00650
      GO TO 10                                                          FIG00660
C
C
   11 IF (INTER(I) .GE. 10000) GO TO 12                                 FIG00670
      WRITE (6,40) I,INTER(I)                                           FIG00680
      PUNCH 40,I,INTER(I)                                               FIG00690
   40 FORMAT(' SAD',I1,2X,'GENERATE',3X,I4,',FN$EXPO,,,8,6')            FIG00700
      GO TO 10                                                          FIG00710
C
C
   12 IF (INTER(I) .GE. 100000) GO TO 13                                FIG00720
      WRITE (6,90) I,INTER(I)                                           FIG00730
      PUNCH 90,I,INTER(I)                                               FIG00740
   90 FORMAT(' SAD',I1,2X,'GENERATE',3X,I5,',FN$EXPC,,,8,6')            FIG00750
      GO TO 10                                                          FIG00760
C
C
   13 WRITE (6,60) I,INTER(I)                                           FIG00770
      PUNCH 60,I,INTER(I)                                               FIG00780
   60 FORMAT(' SAD',I1,2X,'GENERATE',3X,I6,',FN$EXPC,,,8,6')            FIG00790
   10 CONTINUE                                                          FIG00800
C
C
C
C
C
C
```

```
C
C
C  PUNCHES CARDS FOR CATAGORY 10 THOUGH 92
C
C
      DO 50 I=10,92                                                     FIG00810
C
      IF (INTER(I) .GE. 1000) GO TO 51                                  FIG00820
      WRITE (6,35) I,INTER(I)                                           FIG00830
      PUNCH 35,I,INTER(I)                                               FIG00840
   35 FORMAT(' SAD',I2,1X,'GENERATE',3X,I3,',FN$EXPO,,,8,6')            FIG00850
      GO TO 50                                                          FIG00860
C
C
   51 IF (INTER(I) .GE. 10000) GO TO 52                                 FIG00870
      WRITE (6,45) I,INTER(I)                                           FIG00880
      PUNCH 45,I,INTER(I)                                               FIG00890
   45 FORMAT(' SAD',I2,1X,'GENERATE',3X,I4,',FN$EXPO,,,8,6')            FIG00900
      GO TO 50                                                          FIG00910
C
C
   52 IF (INTER(I) .GE. 100000) GO TO 53                                FIG00920
      WRITE (6,55) I,INTER(I)                                           FIG00930
      PUNCH 55,I,INTER(I)                                               FIG00940
   55 FORMAT(' SAD',I2,1X,'GENERATE',3X,I5,',FN$EXPO,,,8,6')            FIG00950
      GO TO 50                                                          FIG00960
C
C
   53 IF (INTER(I) .GE. 1000000) GO TO 54                               FIG00970
      WRITE (6,65) I,INTER(I)                                           FIG00980
      PUNCH 65,I,INTER(I)                                               FIG00990
   65 FORMAT(' SAD',I2,1X,'GENERATE',3X,I6,',FN$EXPO,,,8,6')            FIG01000
      GO TO 50                                                          FIG01010
C
C
   54 INTER(I)=999999                                                   FIG01020
      WRITE (6,75) I,INTER(I)                                           FIG01030
      PUNCH 75,I,INTER(I)                                               FIG01040
   75 FORMAT(' SAD',I2,1X,'GENERATE',3X,I6,',FN$EXPO,,,8,6')            FIG01050
   50 CONTINUE                                                          FIG01060
C
C
      STOP                                                              FIG01070
      END                                                               FIG01080
C
C
C
```

```
      SUBROUTINE ADD(A,B)
C
C    SUBROUTINE FOR COMBINING AGE/SEX GROUPS INTO PROBLEM CATAGORY
C
      IMPLICIT INTEGER (A-B)                                            FIG01090
      DIMENSION A(92),B(2,17)                                           FIG01100
C
C    ADD BY PROBLEM CATAGORY
C
C
C
C    MALE PATIENTS
C
      A(1)=B(1,1)                                                       FIG01110
      A(2)=B(1,2)+B(1,3)                                                FIG01120
      A(3)=B(1,4)+B(1,5)+B(1,6)                                         FIG01130
      A(4)=B(1,7)+B(1,8)+B(1,9)+B(1,10)+B(1,11)                         FIG01140
      A(5)=B(1,12)+B(1,13)+B(1,14)+B(1,15)+B(1,16)                      FIG01150
      A(6)=B(1,17)                                                      FIG01160
      A(7)=B(1,1)+B(1,2)+B(1,3)                                         FIG01170
      A(8)=B(1,4)+B(1,5)+B(1,6)+B(1,7)+B(1,8)                           FIG01180
      A(9)=B(1,9)+B(1,10)+B(1,11)+B(1,12)                               FIG01190
      A(10)=B(1,13)+B(1,14)+B(1,15)                                     FIG01200
      A(11)=B(1,16)+B(1,17)                                             FIG01210
      A(12)=B(1,1)                                                      FIG01220
      A(13)=B(1,2)+B(1,3)                                               FIG01230
      A(14)=B(1,4)                                                      FIG01240
      A(15)=B(1,5)+B(1,6)                                               FIG01250
      A(16)=B(1,7)+B(1,8)+B(1,9)+B(1,10)+B(1,11)+B(1,12)                FIG01260
      A(17)=B(1,13)+B(1,14)                                             FIG01270
      A(18)=B(1,15)                                                     FIG01280
      A(19)=B(1,16)+B(1,17)                                             FIG01290
      A(20)=B(1,1)+B(1,2)+B(1,3)+B(1,4)+B(1,5)+B(1,6)+B(1,7)+B(1,8)+B(1,FIG01300
     19)                                                                FIG01310
      A(21)=B(1,10)+B(1,11)+B(1,12)+B(1,13)                             FIG01320
      A(22)=B(1,14)+B(1,15)+B(1,16)+B(1,17)                             FIG01330
      A(23)=B(1,1)+B(1,2)+B(1,3)                                        FIG01340
      A(24)=B(1,4)                                                      FIG01350
      A(25)=B(1,5)+B(1,6)+B(1,7)+B(1,8)+B(1,9)                          FIG01360
      A(26)=B(1,10)                                                     FIG01370
      A(27)=B(1,11)+B(1,12)                                             FIG01380
      A(28)=B(1,13)+B(1,14)+B(1,15)                                     FIG01390
      A(29)=B(1,16)+B(1,17)                                             FIG01400
      A(30)=B(1,1)+B(1,2)+B(1,3)+B(1,4)+B(1,5)+B(1,6)                   FIG01410
      A(31)=B(1,7)+B(1,8)+B(1,9)+B(1,10)                                FIG01420
      A(32)=B(1,11)+B(1,12)                                             FIG01430
      A(33)=B(1,13)+B(1,14)+B(1,15)+B(1,16)+B(1,17)                     FIG01440
      A(34)=B(1,1)+B(1,2)+B(1,3)                                        FIG01450
      A(35)=B(1,4)+B(1,5)+B(1,6)+B(1,7)+B(1,8)+B(1,9)+B(1,10)+B(1,11)+B(FIG01460
```

```
     11,12)+B(1,13)+B(1,14)+B(1,15)+B(1,16)                             FIG01470
      A(36)=B(1,17)                                                     FIG01480
      A(37)=B(1,1)                                                      FIG01490
      A(38)=B(1,2)                                                      FIG01500
      A(39)=B(1,3)                                                      FIG01510
      A(40)=B(1,4)                                                      FIG01520
C
C     FEMALES UNDER 15
C
      A(41)=B(2,1)                                                      FIG01530
      A(42)=B(2,2)+B(2,3)                                               FIG01540
      A(43)=B(2,1)+B(2,2)+B(2,3)                                        FIG01550
      A(44)=B(2,1)+B(2,2)+B(2,3)                                        FIG01560
      A(45)=B(2,1)                                                      FIG01570
      A(46)=B(2,1)+B(2,2)+B(2,3)                                        FIG01580
      A(47)=B(2,1)+B(2,2)+B(2,3)                                        FIG01590
      A(48)=B(2,1)+B(2,2)+B(2,3)                                        FIG01600
      A(49)=B(2,1)                                                      FIG01610
      A(50)=B(2,2)                                                      FIG01620
      A(51)=B(2,3)                                                      FIG01630
C
C     ADULT FEMALES
C
      A(52)=B(2,4)+B(2,5)+B(2,6)                                        FIG01640
      A(53)=B(2,7)+B(2,8)+B(2,9)+B(2,10)+B(2,11)+B(2,12)+B(2,13)+B(2,14)FIG01650
     1+B(2,15)                                                          FIG01660
      A(54)=B(2,16)+B(2,17)                                             FIG01670
      A(55)=B(2,4)+B(2,5)+B(2,6)+B(2,7)                                 FIG01680
      A(56)=B(2,8)+B(2,9)+B(2,10)                                       FIG01690
      A(57)=B(2,11)+B(2,12)+B(2,13)+B(2,14)+B(2,15)+B(2,16)             FIG01700
      A(58)=B(2,17)                                                     FIG01710
      A(59)=B(2,4)+B(2,5)+B(2,6)                                        FIG01720
      A(60)=B(2,7)                                                      FIG01730
      A(61)=B(2,8)+B(2,9)+B(2,10)                                       FIG01740
      A(62)=B(2,11)                                                     FIG01750
      A(63)=B(2,12)+B(2,13)+B(2,14)+B(2,15)+B(2,16)                     FIG01760
      A(64)=B(2,17)                                                     FIG01770
      A(65)=B(2,2)+B(2,3)+B(2,4)+B(2,5)+B(2,6)+B(2,7)+B(2,8)            FIG01780
      A(66)=B(2,9)+B(2,10)+B(2,11)                                      FIG01790
      A(67)=B(2,12)+B(2,13)                                             FIG01800
      A(68)=B(2,14)+B(2,15)+B(2,16)+B(2,17)                             FIG01810
      A(69)=B(2,4)                                                      FIG01820
      A(70)=B(2,5)+B(2,6)+B(2,7)+B(2,8)+B(2,9)                          FIG01830
      A(71)=B(2,10)+B(2,11)+B(2,12)                                     FIG01840
      A(72)=B(2,13)                                                     FIG01850
      A(73)=B(2,14)+B(2,15)                                             FIG01860
      A(74)=B(2,16)                                                     FIG01870
      A(75)=B(2,17)                                                     FIG01880
```

```
      A(76)=B(2,1)+B(2,2)+B(2,3)+B(2,4)+B(2,5)                          FIG01890
      A(77)=B(2,6)+B(2,7)+B(2,8)                                        FIG01900
      A(78)=B(2,9)+B(2,10)+B(2,11)                                      FIG01910
      A(79)=B(2,12)+B(2,13)                                             FIG01920
      A(80)=B(2,14)+B(2,15)+B(2,16)                                     FIG01930
      A(81)=B(2,17)                                                     FIG01940
      A(82)=B(2,4)+B(2,5)+B(2,6)+B(2,7)+B(2,8)+B(2,9)+B(2,10)+B(2,11)+B(FIG01950
     12,12)+B(2,13)+B(2,14)+B(2,15)                                     FIG01960
      A(83)=B(2,16)+B(2,17)                                             FIG01970
      A(84)=B(2,4)                                                      FIG01980
      A(85)=B(2,5)+B(2,6)                                               FIG01990
      A(86)=B(2,7)                                                      FIG02000
      A(87)=B(2,8)+B(2,9)                                               FIG02010
      A(88)=B(2,10)+B(2,11)                                             FIG02020
      A(89)=B(2,12)+B(2,13)                                             FIG02030
      A(90)=B(2,14)+B(2,15)+B(2,16)                                     FIG02040
      A(91)=B(2,17)                                                     FIG02050
      A(92)=B(2,4)                                                      FIG02060
C
      RETURN                                                            FIG02070
      END                                                               FIG02080
```

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. ABSTRACT

A simulation model of the Family Practice Clinic at Silas B. Hays Army Hospital, Fort Ord, California, is presented. The inputs to the model are the number of doctors, number and type of support personnel, number of waiting and examination rooms assigned and available to the clinic, and the population of potential patients assigned to each doctor, categorized by sex and age. The outputs of the model are the percentage utilization of doctors, support personnel, waiting and examination rooms, and the distribution of various waiting times for those being served by the clinic.

The purpose of the model is to permit hospital administrators to estimate the optimal number of families to assign each doctor in a Family Practice Clinic, and to estimate the support personnel and physical space required to effectively operate the clinic.

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